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LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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EDITORIAL NOTES.

The Future.

THE gas industry issued from the trials and difficulties of last year with honour. Now, from various platforms, we hear of quieter times being before the industry, which seem to suggest a period of repose. The times will not be so strenuous or so anxious as they were during the months between May 1 last and the close of the year. But no feeling of quiescence or lassitude must be permitted to take possession of the responsible men of the industry; for there is work to be done promptly to meet current and prospective conditions. A new order of competition is upon the gas industry. The fact cannot be too strongly emphasized, until the whole of our administrative and executive men are impressed with the desirability of being up and doing. It is not that our strength has been impaired. The gas business of the industry has been growing in a way that is very pleasant to contemplate. But the chief rival is also gaining in strength, and is applying new methods. The gas industry has to ensure that the increased strength of the competitor does it as little harm as possible, either in withdrawing from it business already possessed, or in diminishing its rate of advance. Assisted wiring, hiring and selling powers, and the two-part tariff (whereby the additional units consumed by a householder automatically reduce the average of the price he pays per unit), and practically pre-war charges for current, are being applied to extend the business in electricity. It is no use winking and smiling at these devices; they all prove effective with some people.

Those are present conditions. There are the future ones. The Central Electricity Board have been formed; Engineer, Secretary, and staff have been appointed; and the whole machinery has been established in its offices. The work of the Board has started Now, progressively, electricity will be generated in bulk at the "selected" and the new power stations; gradually, excepting where "selected" stations are in being, electricity managements and staffs will be relieved of all generating responsibility, and will be able to concentrate on local distribution and sales, and current will be sent broadcast through the highways and by-ways of not only urban but rural districts. Those are the conditions; and it is no use gas relying solely on the value for money—highly important though it is—that is placed in the possession of the consumer by the gas industry. We have not only to give good value in heat units for money expended, but we have to see that the consumer realizes good value in utilization. That is the critical point.

There was much said that directed to all this in the speeches that were made at the luncheon of the Southern Association of Gas Engineers and Managers last Wednesday. There was much behind Sir David Milne-Watson's words when he said he agreed that the industry might look forward to easier times, but—mark this—none too easy. There is no pessimism about Sir David. He knows that the future is in the hands of the gas industry, if it will only in every part define, and work up to, the best policy for securing and maintaining it. He also said it is absolutely necessary that "we should remain as vigilant as ever—especially on the technical side." We should like the word "especially" deleted, and "the technical" altered to "every;" for vigilance is required not only in connection with gas production, but with gas sales and utilization and the appliances by which gas is consumed. The practices of the Gas Light and Coke Company that are directed to efficiency cover every quarter of their business. A few sentences later Sir David stated that "everything must be kept right up to the mark;" and, "if we apply ourselves diligently to the problems that are before us, if we look ahead, and efficiently prepare for the struggle that is coming, we shall be able to weather the storm with success, and increase our prosperity." And Mr. Thomas Goulden, M.Inst.C.E., urged that efficiency must be the order of the day throughout the industry; it must, as far as possible, be a general level of efficiency. So far as the big towns are concerned, he does not believe—and this is a view that has been expressed in these columns, and is the one held by many electrical engineers—that the scheme of electricity generation and transmission which is now being taken in hand will have much (if any) effect; but it will in the smaller towns and more remote districts. It is the smaller undertakings that will have, through this development, to meet a completely new order of things. At the same time, the gas interests in the big towns are face to face with the new methods of business development in electricity; so that they too have to be keenly alive to the need of a counteractive policy. In the interests of the whole industry, Mr. Goulden believes that many small undertakings require help in respect of efficiency, through a complete system of control. He quoted bad conditions at small works which have come under his own observation, and which, unless altered, can only lead to disaster for the undertakings concerned, and help to injure the reputation of gas among many people. Where amalgamation with larger undertakings is not feasible, he urges grouping and financial pooling in order to secure the services of a scientifically trained man to inspect periodically plant and operations, and advise upon their conduct. Perhaps, by arrangement, this could be effected by a large undertaking in the area.

Such warnings and appeals are necessary—not to those who are already operating with future conditions in view, and are consequently daily gathering strength in all parts which contribute to the general stability of their undertaking, but to those who, doing well at present, are taking things leisurely, and have little or no thought for the morrow. The morrow largely depends upon the actions of to-day.

Water-Gas Plant in an Extremity.

THE more gas men who went acutely through the mill last year speak of their experiences, the more one is impressed by the capacity and dogged determination of the chief executive officers of the industry, aided by loyal staffs, by the adaptability and flexibility of the industry, with its modern equipment, and by the great strides that have been made in the efficiency, and therefore economy, of that equipment. There was no executive official who had more responsibility thrown upon him during the seven or eight critical months of last year than the Chief Engineer of the Gas Light and Coke Company—Mr. Thomas Hardie, M.Inst.C.E., who is this year the President of the Southern District Association of Gas Engineers and Managers. The address which he delivered to the members last Wednesday deals in the forepart with the ex-

periences of the coal strike, and in the latter part with constructional work. It shows how much the industry was helped last year by modern equipment, which makes a ton of coal go much further productively than it would have done in times past, and handles it at less cost.

The first part of the address reads like romance, and yet it is only plain solid fact, made extraordinary by magnitude, and by the success with which circumstances without precedent were met—although backed by plant and conditions designed for normal work. Mr. Hardie deals with accomplishments in terms of material, plant, and operations in a characteristically plain, matter-of-fact fashion, as though they represented the gamut of considerations. He is naturally modest. The personal element—chief, staff, and men—are all effaced. They only did their duty. But those who know of the disappointments, difficulties, anxieties, and struggles of a wonderful period are fully aware that the crowning success was due in all cases to the brains that advised, devised, and directed. While those engaged in the positions of responsibility have no desire to repeat their experiences of last year, the racking months were not without their valuable lessons, which present many matters in a new light—lessons useful to the industry, and some enlightening to our governing authorities and to the public. Though schemes had been well laid for emergency stocks of manufacturing materials in the light of the worst preceding coal stoppage, they were altogether out of harmony with the actual stoppage period; but nevertheless at least half the time was provided for, and an indomitable courage, and a will to justify the trust reposed in the industry, provided for the rest—but at a price. The industry proved to the country in 1921 that reliance could be placed upon it; it accentuated the testimony of 1921 by that of 1926.

A great deal that is of interest to technical men is found in the address; and we may emphasize a few of the points. During the strike period—gigantic as is their business—calorific values and pressures were maintained by the Gas Light and Coke Company, despite the fact that, by the end of November, they were carbonizing an average of 8400 tons of coal a day, which would have been increased to 13,150 tons had not water gas been available. Those are staggering figures when the time and circumstances are considered. Never has the value of water-gas plant had greater demonstration. Mr. Hardie makes a strong and early point of it. Last year the Company used 31,019,589 gallons of oil and 372,421 tons of coke and breeze in the manufacture of water gas—an increase respectively of 9,866,966 gallons and 56,306 tons over the consumption of the previous year. Neither the President nor anyone else can recollect an occasion when the satisfaction water-gas plants give, the security they provide, and the reliability of their operation, were so fully proved as last year. Small wonder that, with such experiences fresh upon him, he describes these plants as among the safest bulwarks against difficulties in gas manufacture arising out of disturbances in other industries. Had it not been for water-gas plants, the troubles of the country would have been severely increased through the extra quantity of coal that would have been required to supply it with the handiest and most efficient form of fuel. The increase alone in the proportion of water gas made by the Gas Light Company during the seven months of the stoppage resulted in a reduction of 354,000 tons in the quantity of coal which would otherwise have had to be carbonized to maintain the old proportions; and the President calculates that the increased make of water gas throughout the country represented a saving of at least 1¼ million tons of coal. In every quarter of the country there were gas undertakings which did their part in producing this economy. It is interesting to learn from the address that in the South of England there exist water-gas plants capable of producing approximately 55,000 million c.ft. a year, and that the total gas output of the area is about 135,000 million c.ft. per annum, which is roundly 50 p.ct. of the output of the industry. The story goes on, and informs us how some undertakings, in maintaining supply with water gas, absorbed all their own coke production, and in some cases had to purchase from other gas-works. To preserve supplies of gas coke for local consumers, the Gas Light Company purchased oven coke from the Continent for water-gas making, and learned more about its clinkering qualities than they knew before. The same applies to the coke made by them from Continental coal. However, on the point of flexibility, we have this interesting feature—that the combination of carburetted water-gas and coal-gas plants places in the hands of the gas engineer the possibility of varying the quantity of gas available for sale from a ton of coal, with the proportionate quantity of oil, from 70 to 250 therms (which latter figure represents a high thermal efficiency), and the quantity of coke available for sale from 12 cwt. to *nil*. These are fascinating data; and the country have something for which to be grateful—that water-gas plants form such an effective member of the equipment of British gas-works. We imagine the figures presented by Mr. Hardie will often be quoted in technical discussions.

Incidentally, in the address we have references to experiments for boosting-up production; and among the expedients tried last year was the gasification of oil and bitumen. Trial was made in this direction, in both horizontal and inclined retorts, with the view of securing aid beyond the capacity of the water-gas plants. The most successful method was found to be when oil was injected by steam or run by gravity into retorts, which method enabled the realization from each retort of an output similar in amount to that when using coal. The gas yield per gallon was just under 1 therm—the quality being about 700 B.Th.U., while the fuel consumption for heating the retorts was 22 lbs. of coke per 1000 c.ft. of gas made. Taking the expenditure of oil and coke for the production of under 1 therm of gas, the efficiency was poor. Bitumen was found, under certain conditions, to be an advantage. An addition of 5 p.ct. to the coal increased the quality of the gas by 50 B.Th.U., and the therms per ton by seven or eight. Although laboratory tests showed that 200 therms could be produced per ton of bitumen, there had, in order to prevent trouble, to be limitation to 5 p.ct., owing to the low melting-point of bitumen. This is all testimony to very fine endeavour.

The Engineer's Responsibilities.

It is a very proper thing to try to obtain such a diversity of business that the gas demand curve shows few high peaks and few deep valleys. But any effort to do that is mocked by the trend of development. Gas use is controlled by domestic convention and seasonal conditions; and the gas industry has no power over the one or the other. Gas-fires are used as the weather dictates, meals are prepared pretty generally at the same hours, so are hot baths, and the incidence of the demand for lighting is consistent in every supply area. Before coming to the second part of his address, Mr. Hardie instanced how the responsibilities of the engineer have increased owing to the divergencies in demand. The colder weather experienced during the first two months of this year compared with last year caused a heavy demand for gas, in spite of the higher price due to the coal stoppage; and, as the President says, these increases are warnings as to the consumptions which would, with severe weather, have to be met at the end of December. This shows how the old order has changed in respect of the gas-supply provision that the engineer has to make. He has to legislate not on the basis of past, but to comply with unknown, conditions; and thus the necessity for introducing into gas-making equipment the elements which will give him a large production flexibility. What this means for the Gas Light and Coke Company is something of an enormous character. The consideration of annual increase alone will not give much guidance. The nearest indicator of probable consumption is the record maximum day's output, *plus* the likely requirements of new consumers and increased connection of appliances. It is a remarkable fact with which Mr. Hardie presents us when he states that the average annual increase since 1921 in the area now served by the Gas Light Company has been 1774 million c.ft; while the whole of the statutory undertakings of the country show an average increase of 9170 million c.ft.

Thus have conditions of demand and provision to meet it entirely changed. In regard to this provision, the President shows that the modern conditions have been met not

only by extensions of plant, but by modernization in reconstruction, and by tuning-up old plant. One notable achievement is that, in the case of the horizontal and inclined retorts possessed by the Gas Light Company, the average daily output per retort in operation increased from 11,300 c.ft. in 1900 to 16,100 c.ft. in 1925. At one time the horizontal retort was far from being the efficient instrument in production that it is to-day. So much has it advanced in productive rank that Mr. Hardie is able to point out that to-day there is very little difference in the labour costs of horizontal and vertical retort plant; and the main reason which has led his Company to adopt vertical retorts in several of their reconstructions has been the necessity for obtaining the largest possible output of gas upon a given ground area. Table I. in the address, particularly the columns referring to horizontal and vertical retorts, will, in this relation, be studied very closely, in order to pick-out the respective important relative values of the two systems—taking alone the two selected houses. The carbonizing wages per ton show a slight advantage for the horizontal system—15·9d., compared with 15·93d. for the vertical retorts. (The inclined ones can be disregarded.) Calculated out at per therm, the figure would show a slight advantage on the side of the vertical retort. As already mentioned, the importance of making as much gas as possible on a given area of London land is the dominating consideration for the Company. The old horizontal house with which comparison is made has a width of 100 ft.; but the same output could have been obtained with a width of 65 ft. The therm production per square foot per day is 0·96, compared with 2·71 from the vertical retorts. But with a house width of 65 ft., the horizontals would give 1·48 therms per square foot per day; and in a house specially constructed for verticals, the 2·71 would be improved. Table I. gives good scope for discussion.

The remainder of the address is chiefly devoted to a description of the plant changes which have been made at the Bow Common Works. It is too big a story to enter into here. Special interest, however, will be found in the sections dealing with the methods adopted for reducing transport costs, and the construction of reinforced concrete purifiers. The costs of reconstruction are also set out; and an account is given of a most complete system of retort-house control introduced at the Southall Works by Mr. J. S. Thorman, which presented the accruing advantages. The subjects treated upon in the address are many and varied. Not a single part is without interest; and, indeed, from beginning to end it is a composition of no small value to all gas engineers upon the trend of modern practice, with efficiency and economy as the goal.

Courses for Teachers in Gas Engineering and Supply.

The Board of Education are making an attempt to improve the teaching of various subjects in technical schools, and in a way which, we think, will attract more applicants for participation than, at any rate for the first year, accommodation will allow. We reproduce in a later column the details of this scheme so far as they apply to "Engineering Science" and "Gas Engineering and Supply." As this is the first effort of the kind to elevate the teaching of gas subjects in technical schools, Mr. Walter Hole, the Organizing Secretary to the Institution Education Scheme, has asked us specially to emphasize the course, and to draw attention to the fact that those who desire to take advantage of the facilities offered must send their applications to the Secretary of the Board of Education, Whitehall, London, S.W. 1, before April 13. This does not give much time for decision and application; but it may be pointed out that the Board cannot consider any applications received after the date mentioned. The course in "Engineering Science" will be held at Merton and Oriel Colleges, Oxford, commencing on Saturday afternoon, July 23, and closing on Wednesday morning, Aug. 3. The course in "Gas Engineering and Gas Supply" will be held in London from Saturday, July 16, to Friday, July 22, inclusive. The reason for the necessity of early application by those who are confident (apart from unforeseen circumstances) that they will be able to attend is that the number of teachers who can be admitted to each course is limited; and therefore no one should apply who is not certain of being able regularly to attend all the lectures and discussions from the beginning to the end of the specified period. The financial obligation attaching to the courses is exceedingly small, due to the generosity both of the Board of Education and of those collaborating with them. Instruction will be free, subject to compliance with the rules. The actual expenses incurred in travelling from the teacher's usual residence to the place where the course will be held will be refunded. The only obligation upon the successful applicants will be their own maintenance, for which arrangements have been made which are modest. At the "Engineering Science" course at Oxford, the members will reside at Merton College. The inclusive charge for board, lodging, and attendance for the full period of eleven days will be at the rate of only 10s. a day. For those teachers attending the "Gas Engineering and Gas Supply" course in London, hostel accommodation will be provided at the Training College in Horseferry Road, Westminster, at an inclusive charge of £2 10s. per week. We feel sure that many teachers will wish to take advantage of this course, and that it will prove of great advantage to them in their work, and thus to their pupils.

Amalgamation and Co-operation.

One of the arguments against amalgamation of businesses is that efficiency is impaired, individual effort and responsibility gradually find their way into the background, the consumer suffers from the reduction of competition, and so forth. Yet we see almost weekly that there is some fresh case of amalgamation of important businesses—businesses run by some of our keenest industrialists and trading magnates, whose whole careers have shown that to them the fundamentals of new discovery and greater efficiency in production, selling, and distribution are inseparable and inspiring forces. We cannot say that the instances we have had in the gas industry of the amalgamation of gas undertakings have had any bad effect upon progress in efficiency from production to service. The greater responsibility which amalgamation involves has invariably been an incentive to increased endeavour; and the public have benefited thereby. We are reminded of these matters by the address which Mr. H. James Yates delivered at the meeting of Radiation Ltd., and which was published last week. He did not go beyond the bounds of known facts when he stated that, in their case, amalgamation has not impaired incentive, but that the fusion of resources, energy, and specialized experience has had the effect of increasing it. At the same time, he stated that research work has been the backbone of the success of the amalgamated Company. At each of their works, there are chemical and physical laboratories; and pure research work is carried on at the Central Research Laboratories in London. Naturally this work of exploration, with the view of progress in new invention and improvement, entails heavy expenditure; but Mr. Yates says he is more than convinced that it is well warranted by the results attained. The outlay is not limited to the laboratories; a considerable amount of work has to be done and paid for in translating the results of research into practical commercial propositions. If there is satisfaction, despite the expenditure, on the part of Mr. Yates and his co-Directors, then we may be sure that the view now so commonly held, that research is to-day the chief instrument in our technical and commercial progress, has sound foundation and will endure. Without research work, with the subsequent proving of the results in the workshops, we should be standing still, while the industrialists of other countries, more enlightened, would be making headway. It is highly satisfactory to know that, while the gas-supply industry is making progress at one end of its work, the manufacturers are, by the aid of research and experience, searching out ways and means to promote business at the other end. This will result for the consumer not only in greater efficiencies and economies per therm expended, but in extending operating efficiencies, and thus make appliances and the agency of gas more and more

attractive. Those who take account of developments about us, and know what they presage, are aware that it is only by high standards of working from coal carbonization to gas utilization that our future is best assured.

Price of Gas Oil.

In our "Correspondence" columns, Mr. Frank Livesey, M.Inst.C.E., of Maidstone, rightly protests against the attempt that is being made by the firms who supply gas oil to demand and obtain prices above those ruling twelve months ago. The matter is very much in the hands of buyers, if they will only act together. Mr. Livesey suggests that buyers should hold off, and refuse to contract ahead, except at pre-strike prices. Then the sellers would have to fall into line with the producers of solid fuel, who are now quoting pre-strike figures. The more in this matter we are together, the fairer sellers will be.

Rubber Belts and Coke Handling.

At Beckton a rubber belt for the distribution of coke over a range of storage hoppers is in full work after having carried upwards of 240,000 tons.

Drying Gas and Testing Conditions.

In the "Journal" for Feb. 16, p. 397, a letter appeared from Mr. C. Harris, of Taunton, regarding the adoption by him of a gas-drying system at his works. Detailed information as to experiences are to be submitted at a meeting of the Southern District Association of Gas Engineers and Managers. When that will be has not yet been announced. In his Presidential address to the Association, Mr. Thomas Hardie, referring to the subject, stated that the present method of testing calorific value with the gas saturated with water vapour, if retained after artificial drying is adopted, would involve a loss of approximately 1 p.ct. in the revenue of an undertaking. This is rather alarming; but it is an aspect of the question which is under the consideration of the Institution of Gas Engineers. Mr. Hardie has no doubt that it will be possible to suggest some modification to the definitions of the Gas Regulation Act which will prove acceptable to the authorities.

Reduced Assessments.

It will be seen from our "Legal Intelligence" that the Blyth Gas Company have secured a reduction of their assessment from £2537 10s. net rateable value to £1900. In consequence, they are applying for a refund of rates overpaid to the extent of upwards of £600. The Company have been advised to accept the reduction for the current rate only; and when the new Assessment Committee under the 1925 Act come into operation, a further notice of objection will be served—the Company having no desire to embarrass either the present Assessment Committee or the Overseers of the various parishes in closing their books to March 31, as a continuing appeal would do.

The Dénouement.

In the "Journal" for March 2, p. 504, reference was made to a petition, before Mr. Justice Romer, for the compulsory liquidation of the Wareham Electric Supply Company. On March 15, his Lordship was considering a petition for the compulsory liquidation of the Southern Electric Light and Power Supply Company; and the matter was adjourned till March 22, when, in the absence of any opposition, the necessary order was made. On the same day, the Wareham matter was again mentioned, and was further adjourned for a fortnight; his Lordship directing the attendance of witnesses for cross-examination if necessary. He expressed the hope that the case would then be disposed of.

Unemployment.

A good reduction was made during the week ended March 21 in the total number of persons on the registers of the Employment Exchanges. The aggregate figure was then 1,078,500, which was 40,236 less than a week before, but 39,146 more than in the corresponding week of 1926.

The Central Electricity Board.

The appointment of Chairman and members of the Central Electricity Board and the Secretary, with the necessary staff, has been announced in previous issues of the "Journal." The completion of the filling of the chief positions has now been accomplished by the selection of Mr. Archibald Page (who is a Director of the County of London Electric Supply Company) for the office of Chief Engineer to the Board. Mr. Page has been identified with the electricity supply industry for about 28 years. He was one of the Electricity Commissioners from their establishment until 1925, when he resigned to become Director and General Manager of the Company mentioned above. He is Vice-President of the Institution of Electrical Engineers, and Vice-Chairman of the Scottish Centre of the Institution.

Coal Prices.

On the 1st inst., substantial reductions in the retail prices of all grades of coal were made in the London area; and they are now purchasable at 5s. to 6s. per ton below the prices ruling last month. It is not definitely known whether there will be further reductions for the summer; but if no abnormal demand rises, it is probable there will be, and that the merchants will seek to induce householders to stock their cellars in preparation for next winter. It is as yet doubtful what may happen in respect of demand for British coal. In America, about 150,000 miners are leaving work in the central soft coal fields of Pennsylvania, where, it is stated, the miners' union are now fighting for their life. There is, however, a computed reserve of coal in hand of about 80 million tons; and it is declared that the non-union mines are able to supply fully two-thirds of the coal required by the United States. The centre of the struggle is Pittsburg, where one Coal Company have given notice of a reduction from 30s. to 24s. a day for labourers. There have been anticipations as to trouble in the Ruhr and in the French coal-fields; but the latest information from Paris is that the dispute between the mine owners in the Nord and the Pas de Calais and the miners on the question of a reduction of wages has been settled. The miners who receive the maximum wage are to have their payment reduced by 2·60 frs., and the wages in other categories will be brought down proportionately. The sale price of coal, it is stated, has been reduced from 15 to 18 p.ct. according to quality. The lowering of price is partly attributed to the energy of the British coal owners in operating to recover their overseas trade.

OAK HILL ENDOWMENT FUND.

In the "Journal" for Feb. 23, p. 440, the suggestion was made that probably some of the gas undertakings with which the late Rt. Hon. Sir Daniel Ford-Goddard was associated in the gas industry might like to contribute to the Endowment Fund for the Oak Hill Home for Convalescent and Veteran Journalists. As was then mentioned, Oak Hill, Ipswich, is a beautiful estate of some 28 acres, with the mansion which was till his death the home of Sir Daniel. The first response to the suggestion has been that the Governor of the Gas Light and Coke Company (Sir David Milne-Watson) and his co-Directors have voted a contribution of 100 guineas; the British Commercial Gas Association have made a donation of 100 guineas; the Society of British Gas Industries have also kindly forwarded a cheque for £25, and the Secretary of the Society (Mr. Arthur L. Griffith) has made a personal contribution of a guinea. Very heartily the Editor of the "Journal" thanks these contributors for their generosity. He can assure them that there will be great appreciation among journalists—indeed throughout the newspaper world of this country—of this liberality on the part of representative gas interests to the effort of the Institute of Journalists to provide an endowment fund worthy of Oak Hill and the cause which they have so much at heart.

A scheme is in hand to construct a 20 or 22 in. line to carry gas from the Texas Panhandle field to supply the industries of Kansas City, a distance of 450 miles. This, it is said, will be the longest single gas main construction ever undertaken at one time; and the cost is estimated at $20,000,000.

PERSONAL.

Mr. John E. Cowen, the Chairman of the Newcastle-upon-Tyne and Gateshead Gas Company, has been appointed Sheriff of Northumberland.

Mr. W. R. Herring, M.Inst.C.E., has returned to London from South Africa, which he visited for the purpose of advising the Johannesburg Municipality upon the tenders for their new gas-works.

An interesting ceremony took place on March 29, when the Chief Officials of the Oldham Corporation met at the Town Hall to make a presentation of a gold hunter watch, suitably inscribed, to Mr. Tim Duxbury, on his retirement from the position of Gas Engineer. The Town Clerk, Mr. Joseph J. Williams, in making the presentation, spoke of the happy relations that had existed between himself and Mr. Duxbury, and of the valuable help he had received from him. He was sure that similar relations had existed between Mr. Duxbury and other officials of the Corporation; and on their behalf he wished Mr. Duxbury the best of health and prosperity in the future. Mr. Duxbury, in reply, thanked the officials for the present and for their kind remarks. He had had nearly fifty years in Corporation service, of which 25 years had been spent at Oldham.

OBITUARY.

ARNOLD WISEMAN BRANSON.

It is with much regret that we have to record the death, which occurred at his residence, Ribble House, West Hartlepool, on Saturday last, of Mr. Arnold W. Branson, General Manager, Engineer, and Secretary of the Hartlepool Gas and Water Company.

Mr. Branson, who was a native of West Hartlepool, began his career as a pupil of the late Mr. Thomas Bower, at that time Engineer and Manager of the Hartlepool Gas and Water Company; and he subsequently became his Chief Assistant. In 1907 he entered the service of the Rhymney and Aber Valley Gas and Water Company as Engineer, Manager, and Secretary, at a time when that Company was a non-dividend paying concern. During the seven years that he remained there, the Company's position was greatly improved. More than £100,000 was spent on extensions and improvements, and the shareholders received a return on their investment. Gas was taken into ten new colliery villages, and water to three; the total number supplied in 1914 being 25 with water and 19 with gas. Mr. Branson erected complete new works at Caerphilly, including vertical retorts. During the time he was there the make of gas increased by more than 100 million c.ft. per annum, and the revenue by £25,000 a year.

In June, 1914, Mr. Bower retired from the position of Engineer and Manager of the Hartlepool Company, and was appointed Consulting Engineer; and Mr. Branson returned to West Hartlepool to succeed him. Not long afterwards he experienced the anxiety caused by the bombardment of the town by a portion of the German Fleet. This occurred in December, 1914, and resulted in damage to holders at the old and new works, and also serious injury to the water-works buildings. A number of interesting photographs showing the effects of the bombardment will be found on pp. 723-24 of the "Journal" for Dec. 29, 1914.

Mr. Branson was a Past-President of the North of England Gas Managers' Association and of the Wales and Monmouthshire District Institution of Gas Engineers and Managers. Some time ago he was appointed a Justice of the Peace. He was well known in Masonic circles, and took a keen interest in local sporting and athletic societies. He was 53 years of age, and leaves a widow and family, to whom sincere sympathy in their bereavement is extended.

THE RT. HON. T. McKINNON WOOD.

The Late the Rt. Hon. T. McKinnon Wood.

Among the "Obituary" notes in last week's issue, the death was recorded of the Rt. Hon. T. McKinnon Wood, Chairman of Glover & Main, Ltd. The interment took place on Tuesday of last week. On the occasion, the Rev. R. J. Evans, Secretary of the London Congregational Union, said of our late friend: "Deeds were more to him than words, and his life was one of high idealism, integrity of character, of vision, and of patient and persistent endeavour."

FORTHCOMING ENGAGEMENTS.

April 8.—North British Association of Gas Managers.—Spring meeting at Dumbarton. Inspection of the new gas-works.

April 9.—Manchester and District Junior Gas Association.—Visit to the Widnes Gas-Works.

April 9.—Scottish Junior Gas Association (Western District).—Annual meeting. Address by Mr. James McLeod.

April 12.—Federation of Gas Employers.—Meeting.

April 12.—National Gas Council.—Meeting.

April 22.—London and Southern District Junior Gas Association.—Meeting at the Westminster Technical Institute at 7.30. Paper by Mr. E. C. Holt entitled "Recent Improvements in Dry Meters."

April 23.—Yorkshire Junior Gas Association.—Meeting at Huddersfield. Paper by Mr. B. Thorpe. Visit to the Huddersfield Gas-Works.

April 23.—Scottish Junior Gas Association (Western District).—Visit to the Dundee Gas-Works.

April 23.—Scottish Junior Gas Association (Eastern District).—Visit to the Kirkcaldy Gas-Works.

April 30.—Wales and Monmouthshire Junior Gas Association.—Annual meeting at Newport.

May 4.—Manchester and District Junior Gas Association.—Visit to Donnington Works of C. & W. Walker, Ltd.

May 5.—Eastern Counties Gas Managers' Association.—Spring meeting at Ipswich.

May 5.—North of England Gas Managers' Association.—Annual meeting at Newcastle.

May 6.—London and Southern District Junior Gas Association.—Annual business meeting at the Westminster Technical Institute at 7.30.

May 7.—Midland Junior Gas Association.—Visit to the Foleshill Works of the Coventry Gas Department.

May 12.—Midland Junior Gas Association.—Annual meeting.

May 19.—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—Meeting at Abergavenny.

May 20.—British Commercial Gas Association.—Manchester District Conference at Buxton.

May 21.—Yorkshire Junior Gas Association.—Visit to the Keighley Gas-Works.

May 21.—Scottish Junior Gas Association (Eastern District).—Annual meeting in Edinburgh. Presidential address of Mr. M. Darling, of Cowdenbeath.

May 26.—Midland Association of Gas Engineers and Managers.—Spring meeting at Dudley.

May 26.—Society of British Gas Industries.—Annual general meeting and dinner, at the Hotel Cecil.

June 11.—London and Southern District Junior Gas Association.—Visit to the Margate Works of the Isle of Thanet Gas Light and Coke Company.

July 12.—National Gas Council.—Annual meeting.

Institution of Gas Engineers.

April 11.—Council meeting.

April 12.—Advisory Committee on Education.

June 14-17.—Annual General Meeting in London.

ELECTRICITY SUPPLY MEMORANDA.

"E.D.A.'s" Activities.

The British Electrical Development Association has become stronger with time. The annual report informs us that the additions to the membership last year were nine municipal undertakings, sixteen companies, and two Colonial concerns, which gave the following membership: Municipal undertakings, 150; London companies, 14; power companies, 14; provincial companies, 96; Colonial undertakings, 4; manufacturers, 234; contractors, 1155; and wholesalers, 70. During the year over eighty lectures were given to Rotary Clubs, Chambers of Commerce, and other bodies. The Association now own twelve kinema films. An exceptionally large amount of literature was distributed during 1926. Special advertising of late window lighting was a feature of the year. Exhibitions have been supported; and the house at the Ideal Home Exhibition of 1926, at which ancient and modern house equipment was spectacularly staged, attracted 150,000 people, 12,000 of whom made inquiries and left their names and addresses. Support was also given to the Women's Electrical Association. But the masterpiece was the Wiring of British Homes Campaign, about which we shall probably hear more when the report is issued for 1927—if not earlier.

Co-operative Advertising.

"E.D.A." has an annual dinner. It was held on the same day as the annual meeting, with the newly-elected President (Sir James Devonshire) in the chair. The Central Electricity Board and the Electricity Commissioners were represented. "Co-operative Publicity" was a toast confided to Dr. S. Z. de Ferranti. His speech was excellent; but these sentences are particularly worthy of note here: "The 'E.D.A.' is doing something which is much more useful, and on a much higher plane, than ordinary advertising, because it does not deal with the goods of a particular manufacturer, but educates the public to the need for the general use of a commodity supplied all over the country. This co-operative advertising in the electrical industry is not being done to anything like a sufficient extent; and we are not spending sufficient money upon it." After that philosophic remark, the Rt. Hon. C. A. McCurdy, in replying to the toast, appears from one report to have "put his foot into it" by referring to gas. He was telling those present how the work of the National Milk Council resulted in the consumption of milk going up in this country from 72 to 91½ million gallons; while a co-operative campaign in respect of tea resulted in an increase in consumption—even in India. He then went on to cite gas as another example. Regarding this piece of boldness, the "Electrical Times" says: "This selection of the gas industry as an example was not altogether happy in the circumstances; and his audience did not fail to remind him of the fact." What this means we are not quite sure. Is it that those who were present are so jealous of the development successes of the gas industry that even a good dinner at the Savoy will not allow them to tolerate any reference to the rival? The reporter in our contemporary adds: "It was something of a *faux pas*, which an attempt was made to cover up by referring to gas as being, in the eyes of electrical people, an obsolete and decaying industry." If Mr. McCurdy really made that "attempt," the folly of it was greater than the mistake of mentioning "gas," which, we know, is as bad, with a certain type of electrical men, as holding a red rag before a bull. Mr. McCurdy might be told privately that, if the gas industry is an "obsolete and decaying" one "in the eyes of electrical people," they are only those who are the myopes of the electricity industry, and not those who year by year follow the statistical history of gas. The speech-making wound up by Sir Andrew Duncan, the Chairman of the Central Electricity Board, promising that the Board would be neither arbitrary nor autocratic. Although the Board could not advertise, he wished the "E.D.A." God-speed in advertising the wares in connection with which the Board would function.

Subsidy Houses and Electricity.

The "Electrical Times" has been recently very busy giving particulars of municipal activity in regard to the wiring of subsidy houses for electricity. Among other places, Gateshead has been mentioned. To Mr. T. J. Clayton, who looks after the electrical interests of the tenants on the Corporation estates, our contemporary is indebted for certain information. He states that the present position is as follows: On the Carr Hill Estate, the five-roomed houses, in addition to lighting, are equipped with electric cooker, wash-boiler, water-heater on storage tank, one 2-kw. radiator, and a combined heating and lighting plug in living-room, each bedroom, and parlour. There is no fireplace in any of the bedrooms. Equipped as stated, there are at present 342 houses occupied; 55 have still to be completed—making a total of 397, which are described as "all-electric." Regarding this estate, Mr. Clayton naturally does not mention that the making of these houses all-electric was due to a decision by a majority Labour Council as an experiment, in spite of the fact that the gas scheme submitted was less expensive. The houses which are now being erected and similarly equipped are merely the completion of this particular scheme. Mr. Clayton remarks: "It is now possible to judge the extent of satisfaction given to the tenant of this type of municipal dwelling. The energy is supplied and the tariff fixed by the County of Durham Electrical Power Distribution Company, Ltd., as follows: 1d. per unit consumed, *plus* standing charge of 4s. 6d. per month for a five-roomed house; 4s. per month for a four-roomed house; 3s. 6d. per month for a three-roomed house. Prepayment shilling-in-the-slot meters are installed. No rentals are charged for either meter or apparatus. The net result is entire satisfaction." From information received, we should not say the "net result" is "entire satisfaction." We believe that many of the tenants are very dissatisfied, and cannot afford the heavy costs, with the result that they are using coal fires for cooking purposes. In view of this, we imagine the Gas Company are not without hope of eventually getting supplies of gas into these houses for cooking purposes. Another point is that the bedrooms have no flues, which means that gas fires cannot be fixed; and if the tenants cannot afford electric radiators, they must do without heat, or adopt messy oil as the agent. There is good ground for pitying people who are condemned by their local councils to live under such conditions. Regarding the Council's Bensham Estate, here the houses are fitted for electric lighting only; 50 are occupied, and there are 154 to complete. The use of electricity for lighting only on this estate is attributable by Mr. Clayton to the fact that, owing to the high cost to the distributing authority of providing service for all-electric purposes, they were unable to quote terms for the same competitively with the Gas Company. It is interesting to note that the 204 houses on this estate were decided upon after the schemes for the Carr Hill Estate and the Albany Road and Cannon Street Estate, and that, although they are electrically lighted, each is fitted with a gas-cooker, gas-fire, and gas wash-copper. Concerning the Albany Road and Cannon Street Estate, the Council (since the all-electric scheme was put into operation on the Carr Hill Estate) have erected 154 houses in flats to accommodate people whose homes have been displaced by street improvements; and these are all equipped with gas lighting, gas cookers, gas wash-coppers, and in some instances gas fires.

Law of Easy Payments.

An article by Mr. W. Eric Jackson, LL.B., Barrister-at-Law, in the "Electrical Review," contains valuable warning to all engaged in the selling by hire-purchase or hiring-out of appliances. There is a great distinction between a transaction in which a person buys an article, and pays the agreed price in instalments, and one in which a person hires an article, pays rent for it, and becomes the owner when a certain sum has been paid. The one is an ordinary sale; the other is not a sale at all, but a hiring. In hire-purchase, the owner loses all hold upon the goods; and the buyer becomes absolute owner. He can do what he likes with the goods, and is only responsible for the agreed price. On the other hand, in a hiring agreement, the supplier (Mr. Jackson says) remains the owner of the goods until all instalments have been paid. The buyer can be sued for damages, and anyone to whom he has re-sold the goods can be proceeded against by the real owner for detention. Thus the difference between "deferred payment" and "hire-purchase." Whether a transaction falls within either class depends on the terms of the agreement. Mr. Jackson advises that this should always be in writing (though not legally necessary), and stamped with a sixpenny stamp. Obviously there are very fine loopholes which it is necessary to avoid. It is pointed out by the author that the Courts have held that a hire-purchase contract which provides that the hirer shall have the goods, pay rent for them, and become owner when twelve payments have been made is a person who has "agreed to buy." The same has been held in a case when the agreement said the buyer should, when all the rent has been paid, become owner on payment of a shilling. The result was that the buyer who had sold the goods was able to defeat the owner's rights. All the owner could do was to claim the unpaid instalments. Had the agreement said the buyer could at any time return the goods without being under any further liability, the position would not have been the same; inasmuch as he would not be a person who has definitely agreed to buy. Mr. Jackson suggests that all hire-purchase contracts should contain a clause to the effect that the owner agrees that the hirer may at any time terminate the hiring by delivering up the goods to the owner; the hirer being liable to pay any rent due up to such termination of the hiring. The trouble is that the owner might have a lot of second-hand goods thrown on his hands which he would rather be without. We have heard of electricity undertakings which have been embarrassed by the return of hired fires and cookers.

Profits and the Rates.

When the Electricity Supply Act of 1926 was passed, there were probably municipal authorities who did not altogether appreciate the full import of one of the provisions in the Fifth Schedule. It is the one referring to the distribution of the net surplus in any year, together with the annual proceeds of the reserve fund when this amounts to the prescribed limit. After stating that the undertakers may apply such surplus and proceeds to (*a*) the reduction of the charges for the supply of energy; or (*b*) the reduction of the capital moneys borrowed for electricity purposes; or (*c*), with the consent of the Electricity Commissioners, in payment of expenses chargeable to capital; or (*d*) in aid of the local rate, it is enacted:

(1) The amount which may be applied in aid of the local rate in any year shall not exceed 1½ p.ct. of the outstanding debt of the undertaking; and

(2) After March 31, 1930, no sum shall be paid in aid of the local rate unless the reserve fund amounts to more than one-twentieth of the aggregate capital expenditure on the undertaking.

This limitation, it may not have been generally appreciated, will debar electricity undertakings from refunding to the rates, even if they have profits available, money which they may have had in the past from the ratepayers to compensate for financial deficiencies in working. But this is the case. In a recent agenda of the Barking Borough Council, it is stated that the Electricity Commissioners have expressed their opinion that the 1926 Act does not permit of deficiencies paid out of rates in the past years to be regarded as liabilities of the undertaking, to be discharged out of subsequent surpluses; and it is not therefore thought permissible for the contribution in relief of the rates to exceed 1½ p.ct. of the outstanding debt of the undertaking.

SHORT COURSES FOR TEACHERS.

To Include Gas Engineering and Gas Supply.

The Board of Education are making arrangements for a number of short courses to be held in the summer of 1927 for teachers in recognized Technical Schools, Art Schools, Junior Technical Schools, Evening Schools, and Institutes, &c., in England and Wales. The subjects will include Engineering Science, at Oxford; and Gas Engineering and Gas Supply, in London.

Teachers who desire to attend any of the courses must make application to the Board of Education on Form 106 e. U. as soon as possible, and in any case before April 13. The Board cannot undertake to consider applications submitted after that. Applicants will be informed as soon as possible whether they have been selected to attend. The selection will be made by the Board. The number of teachers who can be admitted to each course is limited; and it is essential that they should only apply if they are sure that, apart from unforeseen circumstances, they will be able to attend if selected. Considerable inconvenience, as well as injustice, to others may be caused if any of those who have been selected to attend fail to avail themselves of their selection. Teachers will be expected to attend regularly all lectures and discussions from the beginning to the end of the course, and to comply with any rules which may be laid down to ensure the satisfactory conduct of the course. Leave of absence will be given only in very exceptional circumstances.

A teacher who is selected to attend one of the courses will receive free instruction, and, subject to regular attendance at the specified hours and compliance with the rules laid down for the course, will be repaid (within the limits specified below) actual expenses necessarily incurred in travelling from his (or her) usual place of residence to the place where the course is held. The usual place of residence will be regarded as the place where the teacher resides in term time, unless some other place is accepted by the Board for the purpose. The expenses of a return journey will be paid if the teacher returns direct to his (or her) usual place of residence immediately after the course is finished. The expenses which can be repaid will not exceed the cost of the third-class return railway fare by the cheapest route. Other expenses (*e.g.*, cab or omnibus fares or daily travelling fares) will not be allowed in addition. No grant will be made towards maintenance.

Engineering Science.

This course will be held at Merton and Oriel Colleges, Oxford. It will commence on Saturday afternoon, July 23, and close on Wednesday morning, Aug. 3. By permission of the Warden and Fellows, it has been arranged that members of the course will reside at Merton College. The inclusive charge for board, lodging, and attendance for the full period of eleven days at Oxford will be 10s. per day. The number of teachers to be selected will be limited to 45. They will be chosen from applicants engaged in teaching this subject in Technical Schools and Junior Technical Schools.

Courses of lectures in engineering science will be delivered by Prof. F. C. Lea, D.Sc., and Mr. A. R. Horne, O.B.E., B.Sc. The lectures will be supplemented by a series of experimental lectures and demonstrations dealing with the latest developments of various branches of engineering. Particular attention will be paid to the technique of teaching, dealing with modes of approach and presentation of fundamental ideas. For this purpose members will be divided into groups of four, and each such group will be under the direction of an experienced tutor for a period of one hour each day.

The afternoons will be available for recreation, private study, or directed reading; and a library of about 400 volumes of recent books dealing with science, engineering, and education will be available in the college for the use of members throughout the period of the course. The evening sessions will be devoted to lectures on special subjects of interest to engineers, delivered by distinguished authorities in science and engineering, and to addresses and discussions on methods of teaching.

Gas Engineering and Gas Supply.

This course is arranged for actual or intending teachers of gas engineering, gas supply, and subsidiary subjects, and will be held in London from Saturday, July 16, to Friday, July 22, inclusive. The number of teachers to be selected will be limited, and they will be chosen from those engaged in teaching in courses in gas engineering or gas supply, but not gasfitting.

Through the kindness of the authorities of the Westminster Training College, hostel accommodation will be provided at the College, Horseferry Road, London, S.W.1, with separate bedrooms, board, use of social rooms, tennis courts, &c., at an inclusive charge of £2 10s. per head per week.

The course will include:
(*a*) Lectures and discussions on method of teaching.
(*b*) Practical work in blackboard drawing.
(*c*) Experimental work in a gas supply laboratory.
(*d*) Special lectures on modern problems in gas engineering and supply.
(*e*) Visits to works.

A detailed programme will be issued to teachers selected to attend the course.

MURDOCH LODGE, No. 3480.

The installation meeting of the Murdoch Lodge, No. 3480, was held at the Imperial Hotel, Birmingham, on Thursday, March 17, and was well attended by members and visiting brethren.

The ceremony of installing the W.M. for the ensuing year, W.Bro. H. V. Stanton, P.M. 498, P.P.G.Org. (Worcs.), who had filled the office of S.W., was conducted by the outgoing Master, W.Bro. R. P. Vale, P.M. 560, P.P.G.Std.B. (Worcs.).

Following his induction to the chair, W.Bro. Stanton proceeded to appoint and invest his officers, and subsequently presented a Past-Master's jewel to the I.P.M in recognition of his services during the past year.

The complete list of officers for the ensuing year is as follows:

W.M.	W.Bro. H. V. Stanton, P.P.G.Org. (Worcs.)
I.P.M.	W.Bro. R. P. Vale, P.P.G.Std.B. (Worcs.)
S.W.	Bro. W. A. Twine
J.W.	Bro. R. J. Meiklejohn
Chaplain	W.Bro. W. J. Rendell Baker
Treasurer	W.Bro. F. Jervis
Secretary	W.Bro. T. H. Poulson
D.C.	W.Bro. S. O. Stephenson, P.P.S.G.D. (Sussex), P.P.A.G. Sec. (Worcs.)
S.D.	Bro. J. Brettle
J.D.	Bro. J. R. Duff
Asst. D.C.	W.Bro. R. Scott
Almoner	W.Bro. V. Hughes, P.P.A.G.D.C., P.P.G.P. (Staffs.)
Organist	Bro. W. G. S. Cranmer
Asst. Secretary	Bro. C. C. Barber
I.G.	Bro. J. H. Burrows
Stewards	Bro. L. G. Wilkes Bro. A. Mackay Bro. T. F. E. Rhead Bro. E. B. Tomlinson W.Bro. F. S. Stamp, Prov. G.D.C. Bro. W. H. Adams
Tyler	Bro. W. Littler

At the subsequent banquet the usual Loyal and Masonic Toasts were proposed and duly honoured, and a most enjoyable evening was spent.

London and Southern District Junior Gas Association.—In our report of the meeting of the Association at the Westminster Technical Institute on March 25 (Vol. 177, p. 809) the remarks attributed to Mr. P. C. Gardiner, of Tottenham, were made by Mr. G. Gardiner, of Wandsworth.

NOTES ON NEW BOOKS.

THE LEGALITY OF THE GENERAL STRIKE.*

With the issue of the Government Bill to amend the laws affecting trade unions, interest in the subject will be increased throughout the country. A brochure which we have before us, and which contains a reprint of an article from the "Yale Law Journal" for February by Mr. A. L. Goodhart, Editor of "The Law Quarterly Review," Fellow and Lecturer of Corpus Christi College, Cambridge, is timely, and assists one to a fuller appreciation of the need for a modification of existing legislation. There is uncertainty as to whether, as the law at present stands, the general strike was illegal or otherwise. We have had such legal authorities as Mr. Justice Astbury and Sir John Simon, K.C., declaring that it was. On the other hand, Sir Henry Slesser, K.C., and other prominent legal men hold a contrary opinion, or express considerable doubt on the subject. Now it follows that, if a general strike is illegal or an offence against the State, then the ground for amending the law affecting trade unions is of a less substantial order than is generally believed. The present brochure—through the examination given to the history of the subject, and the governing statutes—shows that not only is there much doubt as to the safeguarding sufficiency of the present law, but that the general strike was actually no offence against it. That at any rate appears to sum up the conclusions of Mr. Goodhart, though naturally one hesitates to accept his views as absolutely final with before us the express statements of Mr. Justice Astbury and Sir John Simon. On the other hand, the case that the author presents contains matter which, in the absence of legal argument, appeals as being incontrovertible. It carries conviction that it is absolutely necessary that the law affecting trade unions should be altered in a manner which will make impossible the holding-up of the country by the trade unions in future without serious consequences to those involved.

Mr. Goodhart gives a succinct history of the general strike. He recalls the famous speech of Sir John Simon, and the subsequent judgment of Mr. Justice Astbury in the National Sailors' and Firemen's Union case. He asks the question: "Why has no serious attempt been made to question the correctness of the judgment?" "The explanation of the rather surprising acquiescence on the side of the Labour party is that it is in the interest of the unions to argue in favour of the judgment; for, if a general strike is illegal, then the most cogent reason for reforming the law relating to trade unions disappears." The author interests us with a review of the law relating to strikes and to trade unions; and when he reaches the Trades Disputes Act of 1906, he quotes section 3, which enacts: "An act done by a person in contemplation or *furtherance of a trade dispute* shall not be actionable on the ground only that it induces some other person to break a contract of employment, or that it is an interference with the trade, business, or employment of some other person, or with the right of some other person to dispose of his capital or his labour as he wills." In view of this section and other enactments which he quotes, the author finds it difficult to see the relevance of Mr. Justice Astbury's statement that "no trade dispute has been alleged, or shown to exist, in any of the unions affected, except in the miners' case." It is clear that except in the mining industry there was no dispute between employers and employees; but, as Professor Holdsworth has pointed out: "It does not follow that the act of striking, and all the other consequential acts, were not done in *furtherance of a trade dispute*. Obviously they were done in furtherance of a trade dispute—to wit, the dispute between the coal owners and the miners." The brochure goes on to show that it cannot be argued that the general strike constituted either treason, seditious conspiracy, or ordinary criminal conspiracy; and towards the end we find these words: "If we are corrcet in our view that the general strike was in furtherance of a trade dispute, and that it was not criminal, then it follows that section 3 of the Trade Disputes Act, 1906, applies, and the leaders were therefore not liable civilly."

However, Mr. Goodhart desires that it shall be understood that, by arguing that the general strike is legal under the law as it stands at present, he does not wish it to be inferred that he is in favour of the continuation of such unlimited right to strike. In his view, the Emergency Powers Act of 1020 ought to be strengthened, so that the State would in future be in a position not only to cope with such an intolerable situation, but also to prevent its arising. It is not until we realize how legally defenceless the public is at present that we can hope for adequate legislation.

We have said enough to show that all who are concerned in industry and labour should make a study of the brochure, so as to be in possession of the reasons why—in view of the happenings of last May, and the threat since made that in due season there shall be further general strikes—the law needs revision.

* "The Legality of the General Strike in England." By A. L. Goodhart, Editor "The Law Quarterly Review," Fellow and Lecturer of Corpus Christi College, Cambridge. Cambridge: W. Heffer & Sons, Ltd.

ELECTRICITY (SUPPLY) ACT, 1926.*

The author of this volume (Mr. John C. Dalton, Assoc. M.Inst.E.E., Barrister-at-Law) brings to bear upon his work a blend of electrical and legal knowledge which has enabled him to crystallize a large amount of material into convenient form, and to give much information which bears upon the genesis of the Electricity Supply Act and the intentions of the Government in relation to the future of electricity supply in this country. The Act, indeed, plans out a new life for the electricity industry, to which there is to be gradual conversion. In his preface to the fifth edition of "Will's Electric Lighting, 1925," Mr. Dalton, referring to the rapid progress that was then being made in the use of electricity for motive power and industrial and domestic purposes, stated that the law regulating the supply and use of electricity has endeavoured to adapt itself to changing conditions, but not perhaps with complete success. As to whether there has been success now, the author prudently makes no pronouncement; the verdict must rest with time. It is not, of course, within the scope of a volume of this kind to criticize the aims and authorizations of the Act; but in his preface Mr. Dalton remarks that "it is true to say that the Legislature has looked ahead, and has endeavoured to direct into co-ordinated channels the greater developments of the future." Also "it is significant that the principal recommendations of the Weir Committee, the original provisions of the Bill as presented to Parliament, and the eventual provisions of the Act differ in few material respects, and thus appear to disclose the confidence of the Government and their expert advisers in the ultimate success of the measure." That does not pin the author to any personal expression of opinion regarding the merits of the Act as a whole. We may, however, at once say that we commend the book for its plain exposition both of the reasons for the existence of the Act, and of the meaning and purposes of its many sections, which, taken as a whole, are so vital to the future of the electricity supply industry.

With striking brevity, Mr. Dalton gives the history of the proceedings which have resulted in placing the Act on the Statute Book. An appreciation of the basis of the Act is furnished by a summary of the Weir Report, which was a curious mixture of known facts and hypotheses, the latter of which is well illustrated by this extract from the volume before us: "The scheme showed that it would be possible to supply H.T. energy at an average price of 1d. per unit. With to-day's conditions, the average price could not be reduced below 1·5d., and would probably not fall below 1·75d. In the former case, the adoption of the technical scheme would result in an annual saving of £44,500,000 on the national electricity bill, and in the latter case in an annual saving of £66,800,000." The recommendations of the Committee are set out. In succeeding chapters there is a review, shorn of all legal phraseology, of the provisions of the Act—the establishment of the Central Electricity Board, the general powers and duties of the Board, finance, acquisition of land, construction of generating stations and other works, system and mode of supply, power and obligation to supply, tariff, prices to owners of selected stations, preparation and adoption of schemes, carrying out a scheme, obligation and rights of owners of selected stations, the relationship of various classes of authorized undertakers and others to the Central Electricity Board, the position of authorized undertakers owning non-selected stations, bulk supplies, joint electricity authorities, power companies, local authority undertakings, company undertakings other than power companies, railway companies, standardization of frequency, sale of fittings, methods of charge, and several other subjects. A useful chapter is one which deals with the various provisions which have for their object the passing-on to the ultimate consumer of the benefits which may accrue under the Act in respect of cheaper supplies. It is wisely remarked, in connection with a subject the issues of which can only be known with the development of the scheme and the progress of time, that "the judgment of the consumer of electricity on the operation of the Act of 1926 will be mainly influenced by the price which he will be called upon to pay for a supply." That is where doubt rests supreme; and it can only be dislodged when actualities afford enlightenment. The text of the Act follows, with, section by section, valuable annotations and elucidation; and, lastly, there is a good index. Anyone who desires to make himself well acquainted with the new Act will find Mr. Dalton's work an invaluable and trustworthy aid; and in a reference library it will always be an excellent companion to those well-known legal authorities, "Will's Gas and Water" and "Will's Electric Lighting."

* "The Electricity Supply Act, 1926." Annotated and Explained. By John C. Dalton, Assoc.M.Inst.E.E., Barrister-at-Law. (Being a Supplement to "Will's Electric Lighting.") Price 10s. 6d. net. London: Butterworth & Co.

GAS DEVELOPMENT THROUGHOUT THE WORLD.

The Place of Brown Coal.

[From a Correspondent]

The Editorial Notes in the "Journal" for March 30 make most interesting reading. It is there said that something in the nature "of a small-scale civil war in Germany" threatens to come into being. From the very latest information received from that country, this small-scale civil war can be shown to be something larger. It would appear, indeed, that there are three parties—all distinct, and each with a separate objective—striving for power in Germany at the moment.

First of all there are the coke-oven owners, dealing with black coal. This black coal produces primarily metallurgical coke and town gas; and this group wishes to distribute gas throughout Germany by long-distance transmission. The centre is Berlin; and details were given, in an article in the "Journal" for Feb. 10, 1926, of the latest developments in transmitting gas long distances. In doing this, the coke-oven owners naturally come up against the second party in the above-mentioned three-cornered fight. These are the existing gas-works. Naturally enough, the gas-works do not care to act as mere local distributors or agents of the big coke-oven combines. On the other hand, being largely dependent upon one or two markets, gas-works find difficulty in producing gas as cheaply as the powerful combines owning the coal and the coke ovens, and having wider markets to which to appeal.

The third party is comprised of the great German brown coal combines. The best known of these combines are the Stinnes Riebeck and the Werschen-Weissenfelser. Brown coal is evoking widespread interest not only in Germany, but throughout the world. It has been pointed out by many technical advisers in this country that it is Germany's discovery, after years of assiduous research, that brown coal can be made an alternative fuel to black coal in many respects, and, through the application of the latest forms of research, even more valuable than black coal. It is this discovery that has revolutionized our preconceptions of industrial life on the continent. It is not going too far to say that, by placing brown coal on the asset side of their national balance-sheet for the first time, Germany, since the war, has completely altered continental politics and European industry.

The brown coal produces vast volumes of a somewhat inferior gas, rather rich in carbon dioxide (as a rule anything from 25 to 30 p.ct. of the gas is carbon dioxide). If the gas is freed from carbon dioxide, it makes a good town gas of about 430 to 450 B.Th.U. value. This gas is good enough for transmission, and is purely a bye-product of the distillation of brown coal for oil production.

Dealing with this aspect, it is important to remember that the greatest bituminous brown coal deposits are, fortunately for Germany, situated in her very centre, round the Halle and Leipzig districts, while the distance from those districts to Berlin is only about one-third of that from the Ruhr and Silesian fields. The brown coal owners are after a "slice of the cake."

Speaking generally, about 7500 c.ft. of gas of about 310 to 330 B.Th.U. is produced from every ton of dry brown coal distilled. When the carbon dioxide is removed, about 5000 c.ft. of gas of high calorific value becomes available. The removal of carbon dioxide can be effected by compressing the gas, and washing it with water under (say) 8 to 10 atmospheres pressure. The water dissolves carbon dioxide preferentially; and in this way the lighter gas is obtained for transmission.

Recently another method has been advocated. That is the conversion of carbon dioxide into carbon monoxide. This is made possible by the intense reactivity of the brown coal residue, which reacts with the carbon dioxide at temperatures much below those required in the water gas producer for gas coke. The gas volume is brought up from (say) 7500 c.ft. to 10,000 c.ft. instead of being diminished to (say) 5000 c.ft. This gas will, of course, have a rather high percentage of carbon monoxide; but it is a most excellent and efficient gas, and has a calorific value of about 420 to 430 B.Th.U. per c.ft.

Sensible Heat Distillation, Ltd., realized the possibilities of using the highly reactive brown coal or lignite residue for this specific purpose. For a number of years this firm have been experimenting with brown coal not only in Germany, but in other parts of the world. Tests of all sorts have been repeatedly made until a considerable store of knowledge has been acquired. The firm, while not in any way professing to be the pioneers of interest in brown coal, and while they are certainly far from being the only seekers after truth, may be said to lead the way by the patents which they have been the first to take out in Germany.

One more point may perhaps be made clear. The Dominions of the British Empire and the Colonies have only to be mentioned in connection with their enormous lignite deposits for a fresh vista to stand revealed before the mind. Take, for example, Australia. There you have the town of Melbourne, situated 80 to 90 miles from the world's biggest and richest brown coal deposits. Successive Governments determined to make Victoria a real producer of man's primary needs. It is to that town not only an advantage, but a necessity in competition with her friends and neighbours, that Melbourne should have cheap gas. At present Melbourne is constrained to import black coal from another State thousands of miles away. I do not underrate the value of black coal gas. I fully appreciate its calorific value and its commercial value. But to anyone knowing Australian sentiment, it will be assumed as a matter of course that each Australian State prefers, with the co-operation of the Commonwealth Government, to exploit and develop her own resources than have to be dependent upon a sister State in the Dominion. This is a form of competition which experience in Australia has shown to be the quickest way to encourage development in each State. I can say emphatically that the huge brown coal deposits so close to Melbourne can make such gas as I have above described, and that it can be piped to that town, to be employed in place of gas from black coal.

Perhaps these few ideas will show what vast fields lie open to-day for the gas engineer. These developments do not displace capital and labour; on the contrary, they increase industrial efficiency by unifying harmoniously the interests within any first-class industrial power.

WATERLESS GASHOLDERS.

A Further Discussion in Germany.

The Posen explosion, and the question of these holders in general, were referred to in our columns on several occasions last year, and again on Feb. 16 last. A report of another conference on the subject, held in Germany on Jan. 10, at the joint instigation of the M.A.N. and the Posen Engineer, Herr Thau, appeared in "Das Gas- und Wasserfach" for March 26, over the signature of Dr. Karl Bunte.

Dr. Bunte first summarizes the position as it stood at the end of Herr Thau's article in our contemporary, of which we gave a résumé on Feb. 16. The Posen holder was the first of its kind of any considerable size, and was erected in 1916. Its construction was avowedly different from that of other holders put up later by the M.A.N. Company; one chief modification in these being the mutual lateral strengthening of the roller stays of the disc. It was the distortion of these radial stays, due to insufficient strength in the frame-work of the disc, which Herr Thau considered was the real origin of the mishap. The M.A.N. had recognized this source of danger, and had accordingly entirely altered the detail of the disc construction in later erections, in such a way as, in their opinion, guaranteed their safety. The Posen Engineer himself may, therefore, be said to have attributed the explosion to a constructional detail which has since been altered. In reply to his article, the Company still maintained that, under normal working conditions, even the older type of disc offered a sufficient margin of safety, but that faulty supervision had imposed too great a strain upon it. They referred to a report by their engineers to the effect that they had found uneven weighting of the disc through the overflow, on to one side of it, of tar from the seal, and an unorthodox attempt to counteract this by shifting the concrete weights.

Second Conference.

On this question of tar on the disc, the statements of the two parties were directly contradictory, and this was the state of affairs when a second conference was arranged on neutral ground at Mainz on Jan. 10—the first conference had been criticized by Herr Thau, as having been held, without representatives from Posen, at the M.A.N. headquarters at Gustavsburg. It was attended by 63 engineers interested in the subject, among them 23 representatives of German gas-works and seven from Holland, England, Switzerland, and Denmark. According to the report, the discussion did little to settle the questions in dispute, but it brought to light several interesting points as regards construction and working experiences.

Tar on the Disc.

If, as the M.A.N. maintained, there was tar on the top of the disc, how did it get there? The discussion revealed that, although automatic tar pumps were provided at Posen for the

filling of the seals, these never worked satisfactorily, and the management consequently decreed hand pumping for one hour at intervals of twelve hours. The question of the pumps was to have been submitted to an arbitration court which had already been set-up to decide upon the suitability of the canvas supplied for the seal, and upon a complaint regarding the heating system. But, owing to political events, this court never sat. The M.A.N. held that this pumping at regular intervals, instead of only when necessary, probably gave rise to an overflow of tar from the seal on to the disc. A long discussion failed to establish agreement between the parties even as to the presence of tar in any quantity on the disc on the occasion of the inspection shortly before the accident. And so there the matter had to be left.

Disc Construction.

Prof. T. van Itterson, of Heerlen, demonstrated, by means of detailed calculations, that, assuming an uneven weighting of the disc and very unequal coefficients of friction, considerable roller pressures might be induced, which could cause contortion of the disc. His figures clearly showed that, with a spacing of the guide rollers unsuitable to the diameter of the disc, and with considerably varying coefficients of friction, comparatively small moments might give rise to a contortion of the disc, and initiate its descent. The discussion, and, it may be mentioned, a subsequent careful calculation, showed, in the valued opinion of the writer of the report, that allowance is made for all these factors in the discs of more recent design. A calculation on the same lines shows that, even assuming very varied frictional stresses, there must have been considerable one-sided weighting to have caused such roller pressures as proved too great for the holder construction at Posen.

Herr Oosterhold, of Eindhoven, called attention to the fact that the sun shining on one side of the holder would cause expansion of the shell and affect the viscosity of the tar, and so lessen the friction on that side.

The end of the discussion of the Posen case was a concession to Herr Thau by the M.A.N. that, since his holder had been erected, considerable variations and improvements in the construction of the disc had been introduced, as a natural result of ten years' experience. To this extent the mishap was attributable to constructional imperfection. On the more immediate causes, no agreement was possible.

Recent Orders for M.A.N. Holders.

Herr Thau was taken to task by several speakers for quoting, in his last article, an English paper in support of a contention that the first conference at Gustavsburg had been insufficiently critical, and that its *venue* and the circumstances of its convocation had been all in favour of the M.A.N. They maintained that criticism, where justified, had been exceedingly sharp, and that reports of satisfaction with other M.A.N. holders had not been given, in order to please the makers of other types of holder.*

Herr Thau's reference, according to a footnote in our German contemporary, was to a comment in our issue of July 21 last, p. 127.

A question at the conference elicited the information that, since the date of the Posen explosion, 17 new holders have been ordered from the M.A.N. Company, totalling 1½ million cub.m. capacity [53 million c.ft.].

Sealing Fluid.

For the rest, the attention of the conference was directed to details of construction. The representatives of the M.A.N. opened this part of the discussion with the question as to whether "Imunol" would make a suitable sealing and lubricating fluid. "Imunol" differs from all other oils so far tried in that it is lighter than water. A solution could no doubt be found to the problem of separating tar and water in the bottom collecting tanks. But, with regard to the use of "Imunol," Herr Jagschitz is doubtful on two points: First, ice, in cold weather, would form not on the surface of the liquor in the seal, but at the bottom of the sealing troughs—in other words, at the very part where elasticity of contact between seal and holder wall is essential. Secondly, the complete separation of water, which would constitute one of the chief attractions of the use of "Imunol," would, in the case of freezing, present a danger. Ice which separates out from tar is of a brittle nature, and easily crushable, whereas the complete separation of water which the use of "Imunol" would provide would give a much harder, and so more dangerous, ice.

The Höchste Farbwerke have carried out tests as to whether disc gasholders are suitable for the storage of pure hydrogen. Experiments have shown that the use of a suitable sealing fluid maintains the gas absolutely free from sulphur, as is necessary for the contact process.

Inspection of Holders.

All M.A.N. holders, where desired, have been inspected since the last conference, and previously given instructions for working them have proved satisfactory in every case. Only minor adjustments were found necessary—as, for instance, on a few of the sealing-trough levers which had not quite sufficient play. Further attention is being directed to the lubrication of the guide rollers. A suggestion was made by Herr Reiser, of Gelsenkirchen, that the diameter of the rollers might be increased, and Herr Klinkhardt, of Oberhausen, urged greater attention to the mixing of the gas in the holder.

More about Sealing Liquors.

Herr Klinkhardt also reported that the trouble he had at first experienced in having to run the pumps too frequently with a tar of 1·8° Engler had now been remedied by using a more suitable grade, and the viscosity had been constant for some months at 12·5°. Herr Oosterhold pointed out that, with non-debenzolized gas, the sealing tar takes up light oils in winter, and gives them up to the gas in summer, and in this way adjusts itself immediately to climatic requirements, except in cases of very sudden changes of temperature. Dr. Holzamer, in charge of the M.A.N. tar investigations, gave details of the work at present being done.

A statement by Dr. Müller, of Karnap, was of especial interest, concerning very good results which he has had with exhausted wash-oil. His explanation is that every tar and tar distillate contains matter which suffers polymerization under the influence of gas constituents and of oxygen. If a tar preparation is used which has already been subjected to these influences in the wash process, it suffers no further changes in the seals.

Detection of Possible Escapes.

A question was put as to the possible usefulness of a CO recorder on top of the disc for the detection of any gas escape into the free space above. Dr. Müller related that, at his suggestion, a firm had brought out such an instrument. But he himself had not taken one into use, as he was convinced that his holder worked with complete safety. In his case, the pressure recorder which showed the movements of the disc was situated on top of it; and this ensured a visit and inspection at least every twenty-four hours.

The conference closed with a discussion of the question of foundations in mining areas, and with a hearty vote of thanks to the M.A.N. Company, who expressed their intention of arranging for further discussions at a later date.

* This is not correct. A full résumé, translated from the German, of the last conference was given in our issue for July 21 last, p. 135. At this, several speakers testified to their good experience.

Liquid Fuel.

It was stated by the Principal, Mr. Geo. Patchin, A.R.S.M., at the final lecture on "Modern Developments in Regard to Fuel," at the Sir John Cass Technical Institute, Jewry Street, E.C., that the series had been eminently successful. In all there were seven lectures of an advanced character, each by a recognized authority on the particular matter that formed the subject of the discourse. The last lecture was on March 28, when Prof. J. S. S. Brame dealt with "Liquid Fuel." Twenty years ago, he said, when he gave a course of lectures on the same subject at the Institute, it was necessary to lay a good deal of emphasis on the advantages of the use of oil fuel, and so on. To-day it was recognized that for many purposes oil fuel was far superior to coal, and was a very close competitor with the best of the gaseous fuels. He did not, of course, intend to claim that for all purposes it was the best fuel to employ. It differed from all competitors by being 99·5 p.ct. combustible; while another point in its favour was uniformity of composition. It was difficult to secure exact figures; but he thought it might justifiably be said that, adding together the imports of fuel oil and the production of fuel oil from imported crude, there were from 2¼ to 2½ million tons per annum actually available in the country.

"Cohesite" Briquette Binder.

In the "Iron and Coal Trades Review" for March 25 there was an article on a new binder—named "Cohesite"—for fuel briquettes. It is stated that, though pitch nearly approaches the ideal, it has a serious disadvantage in that it is apt to affect the health of the men employed. Attempts have been made from time to time to produce an alternative binder which, while possessing the good qualities of pitch, would be free from its defects. "Cohesite" is made up as follows: Asphalt, 48 p.ct.; heavy fuel oil, 5 p.ct.; potatoes, 12 p.ct.; water, 34 p.ct.; preservative, 0·15 p.ct.; and soda silicate, 0·47 p.ct. The article states that moisture must be kept down within very narrow limits if a satisfactory briquette is to be manufactured with pitch as a binder; and as the tendency is to improve the quality of patent fuel, to which end washed fuels are now frequently employed, it is as a consequence frequently necessary, and always desirable, to subject the coal to a drying process before it is mixed with the pitch. With "Cohesite" as a binder, such drying is not only unnecessary, but undesirable. Except that the dryer is eliminated, the briquetting process is precisely the same as with pitch as a binder. The resultant briquette, however, has a smooth skin and is remarkably clean to handle, while it hardens exceptionally quickly.

AN INVESTIGATION OF THE COKING OF COAL.

[Communicated.]

[Recently the Department of Scientific and Industrial Research (Fuel Research) published Technical Paper No. 8 of the Physical and Chemical Survey of the National Coal Resources. This gave the results of an investigation carried out by Dr. J. T. Burdekin on "The Caking Power of Coal." As mentioned in last week's "JOURNAL," in our summary of the findings, the report is obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 1s. net.]

The paper consists of a description of a method which the investigator has adopted for the laboratory determination of the comparative values of different coals for the production of coke. The coals selected for test are representative of the Lancashire, South Yorkshire, and Durham coalfields. The method adopted is to carbonize a known weight of each coal, as well as mixtures containing 90, 80, 70, down to 10 p.ct. of the coal (the remainder being calcined anthracite) under specified conditions in silica crucibles inserted, on a silica tray, in an electric muffle furnace. The cokes produced are then crushed in a testing machine of a steelyard pattern; and by plotting the crushing strength of the cokes (in pounds) against the percentage of coal in the mixtures, it is claimed that a characteristic "caking power curve" is obtained for any particular coal.

The method described is actually an adaptation and combination of methods which have previously been described for the determination of the agglutinating value and the coking power of coal. The author, in his introduction, attempts briefly to review such previous investigations; but here, as well as in the main portion of his publication, he leaves himself open to the serious criticism of not having made himself sufficiently cognisant of the recent literature on the important subject with which he is dealing.

In the first place, no reference is made to comprehensive investigations of the subject which have received fairly wide publication during the last two years —viz., "Scientific Control of Carbonization with Particular Regard to the Agglutinating Power of Coal" (Coke Competition Number, "Gas Journal," November, 1925), and "A Contribution to the Study of the Coking of Coals and a Proposed Standard Method for the Determination of Agglutinating Value" (Journal of the Society of Chemical Industry, June, 1926).

Secondly, it is surprising to find a continuous carelessness in terminology still pervading the text: "Coking coals," "caking coals," "caking qualities," and "coking properties" run riot throughout the pages. Within two pages one finds "good and medium coking coals" and "non-caking or poorly caking coals." In recent publications and discussions, stress has been laid upon the need for a careful definition and selection of appropriate terms relating to the carbonization of coal. It is high time that writers on fuel technology should realize that terms such as "caking qualities" may be left to the farinaceous industries, and that the carbonizing industries should confine themselves to "coking."

With regard to the actual description of the determination, the following statements do not appear to be in accord:

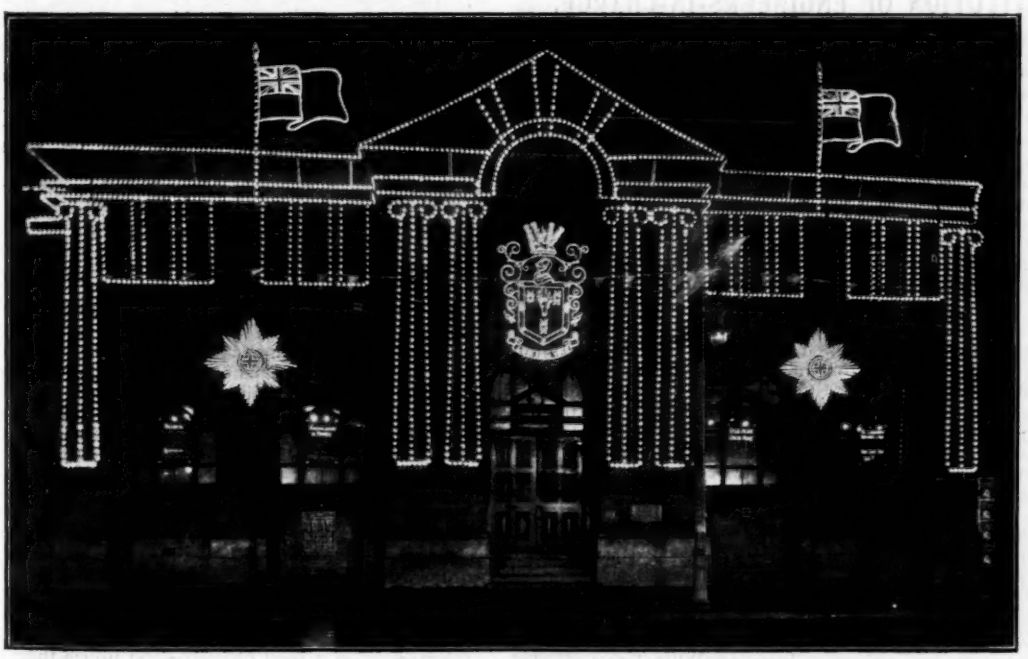
> P. 5. The tray was inserted when the temperature of the furnace was 940° C., but owing to ts (*sic*) cooling effect, the temperature fell to 730° C. . . . at each succeeding minute the temperature was about 748°, 788°, 826°, and 850° C. respectively, while during the seventh minute it was maintained at 860° C.
>
> P. 7. The cokes obtained on carbonizing, under the conditions specified (*during seven minutes at* 860° *C.*) . . .

The statement in parentheses, as well as a similar statement on p. 5, apparently requires considerable modification.

Another apparent contradiction results from the author's hasty conclusion (pp. 12-13) claiming that the prevalent view that certain coals contain an excess of agglutinant over that required to form a good coke is a mistaken one. He states himself (p. 10) that, despite all his efforts, Mountain coal could not be made to yield as strong a coke when carbonized alone as when mixed with inert material. It is an admission of weakness to state that: "The test, therefore, failed to evaluate it, and the coal must be considered as being in a class apart from the others." (It is interesting to note that this coal is well known to have one of the highest agglutinating values of hundreds of coals which have been tested.)

There are several further criticisms which may be levelled against the choice of this method (the definition of the property of a coal by means of a curve) and the choice of an inert material, the composition of which is subject to considerable variations; but sufficient has already been said to indicate that this publication is certainly not a worthy example of the excellent work which one has become accustomed to expect from the Fuel Research Section of the Department of Scientific and Industrial Research.

EXTERIOR DECORATIVE LIGHTING BY GAS.



The accompanying photograph, for which we are indebted to Mr. J. W. Allin, the Engineer and Manager of the West Bromwich Gas Department, is of the decorative lighting of the exterior of the Carnegie Library at West Bromwich during the civic week held there from Feb. 27 to March 5. It shows effectively that gas compares favourably with electricity for this type of illumination. The display was side by side with an electrical scheme on the Town Hall buildings; and in the opinion of the public generally, the former was the more attractive. The effect was obtained mainly by "star" burners with copper devices.

The whole scheme was designed and executed by the staff of the gas undertaking.

AUSTRALIAN MORWELL BROWN COAL.

Its Treatment by the "L & N" Process.

In our article on the aims and objects of the recently formed "L & N" Coal Distillation, Ltd., which was published in the "Journal" for March 16, p. 658, mention was made of the fact that it is proposed to develop by the "L & N" process the Morwell coal seam in Australia. Reference to that article will show clearly that no statement was made to the effect that "L & N" Coal Distillation, Ltd., intended to be responsible for the development of this seam; and in view of Mr. F. D. Marshall's letter in our correspondence columns last week—see p. 818—it is considered desirable to emphasize this point. Mr. Marshall erroneously suggested that in the prospectus of "L & N" Coal Distillation, Ltd., which appeared in the "Morning Post" and "Financial News" of March 11, one of the attractions held out was the projected distillation of the Morwell seam. As a matter of fact, the success or otherwise of the Australian venture will in no way influence the British Company. The Australian concern is wholly independent. The Australian Commonwealth Oils and Fuel Company are to be taken over by what will be known as "L & N" Brown Coal, Ltd., the capital of which is being privately subscribed. The old Company will be reorganized and developed.

Oil Yields from the Morwell Seam.

Recently we had an interview with Mr. H. A. Bradstreet, who is interested in the development of the Morwell seam, with which he is acquainted. He has been in Australia very recently, and intends to return there soon to assist the operations of "L & N" Brown Coal, Ltd. He expressed surprise at the figures contained in Mr. Marshall's letter in last week's "Journal." Mr. Harald Nielsen, he said, had reported on the Morwell coal in March, 1924, and in no case had he found a moisture content greater than 40 p.ct., as contrasted with Mr. Marshall's figure of 44·3 p.ct.

"The amount of coal in the Morwell area," he continued, "is not by any means small. In the newly published Year Book (1926) of the Australian Commonwealth, the reserves of Australian brown coal are stated to be 10,400 million tons, of which 5000 million tons are in the Morwell area. The property owned by 'L & N' Brown Coal, Ltd., contains 400 million tons; and I am satisfied that this is the best coal in the Morwell area. Consequently Mr. Marshall's figures, which relate to approximately 1 ton of coal from the area, cannot be regarded as a criterion of the coal throughout that area, and least of all of the coal which will be exploited by 'L & N' Brown Coal, Ltd. Some of the coal in the Morwell area is on the banks of the Latrobe River; and this fact may explain why Mr. Marshall obtained such poor results from the sample he tested."

Government Figures.

Thinking the question of sufficient interest, we have had recourse to the Official Report for 1922 of the Government of Victoria—Bulletins of the Geological Survey of Victoria, issued by the Ministry of Mines. In this the following figures are given as representing the average yield on the dry coal.

Water of decomposition, galls. per ton	27·0
Oil, galls. per ton	27·5
Gas, c.ft. per ton	6000
Residues, cwt.	11

This coal, though it was not taken from the precise area which "L & N" Brown Coal, Ltd., propose to develop, is, we are informed, fairly characteristic of the coal in that area.

Comparison of Two Reports.

Mr. Bradstreet went on to compare the report of Mr. Nielsen with that of Mr. Marshall. Whereas the latter found 2·94 gallons of net crude oil per ton of coal as weighed at Battersea—say, 6 gallons per ton of dry coal—Mr. Nielsen found 28·3 gallons per ton of dry material. With 25 p.ct. of moisture in the coal, this figure was reduced to 21·4 gallons, and with 40 p.ct. of moisture to 17·1 gallons—a yield six times as great as Mr. Marshall's.

The results of Mr. Nielsen's fractionation tests are given below:

Calorific value of oil, 16,400 B.Th.U. per lb.

Refined Products.	P.Ct.	Sp. Gr.
Spirit to 120° C.	3·1	0·769
Light oil, 120° to 180° C.	13·0	0·923
Medium oil, 180° to 240° C.	16·0	0·952
Wax fraction, including pitch and losses	67·9	

Mr. Marshall's figures were as follows:

Refined Products.	P.Ct.	Sp. Gr.
Light oil (naphtha)	0·4	0·862
Middle oil (burning oil)	32·4	0·935
Residual oil (chiefly lubricating oil)	24·3	0·932
Paraffin scale	0·7	
Loss on refining	42·2	

INSTITUTION OF ENGINEERS-IN-CHARGE.

Twenty-Seventh Annual Dinner.

The capacious Royal Venetian Chamber of the Holborn Restaurant was well filled last Saturday evening, on the occasion of the twenty-seventh annual dinner of the Institution of Engineers-in-Charge; those present including a large number of distinguished guests. The Institution is a well-organized body; and whether the engagement be a business or a social one, it may be relied upon to pass off with perfect smoothness. This was the case on Saturday, when the manifold services rendered by the Hon. Secretary (Captain Alfred E. Penn) were warmly acknowledged by more than one of the speakers. The President (Mr. Loughnan St. Lawrence Pendred) was in the chair.

Need for Practical Training.

The toast of "The Institution" was submitted by Sir Philip Dawson, M.P., who said that in joining such an organization the members had a great deal to gain and a good deal to give. It enabled them to exchange views and knowledge, and thus to secure higher efficiency. The most perfect machinery made would be useless, unless the man in charge operated it with intelligence, care, and foresight. Some people seemed to think that science, mathematical knowledge, and technical academic training were everything. They were highly important; but unless these qualifications were allied to practical knowledge, they would not lead to success. Practical experience was needed quite as much as highly scientific training. Technical training would be of no avail if a man was unable to put things right when no one else happened to be at hand. He appealed to the members to do everything in their power to foster good feeling between employer and employed. Without co-operation they could not hope to emerge from their difficulties.

In the course of his reply, the President mentioned that the membership of the Institution was rapidly approaching the 500 mark, and said it was confidently anticipated that this number would be reached during the next year. Mr. Henry King (Vice-Chairman of the Institution), proposing "Our Guests and Friends," declared that no man could get far ahead to-day without technical education; it was hard enough to do so with it. The response was by Sir Henry Fowler, K.B.E., LL.D. (President of the Institution of Mechanical Engineers), and Dr. W. R. Ormandy.

107 P.Ct. Efficiency.

Reference was made by the latter to some experiments that had been carried out on a new type of boiler, with which it had been found impossible to get less than 107 p.ct. efficiency. There was some laughter at this, and Dr. Ormandy said: "When we say a thing is 100 p.ct. efficient, we merely mean when judged by the method employed to measure efficiency to-day. If this method is wrong, our measurement of 100 p.ct. falls to the ground. I shall be surprised if in course of time many of our ideas as to what constitutes 100 p.ct. efficiency in the burning of fuel are not entirely upset."

Mr. W. Edwards (Chairman of the Institution) proposed "Our President," and pointed out how much Mr. Pendred had done for the Institution, which had enjoyed a highly successful year under his guidance. The President, in reply, told his hearers that it was, to his mind, absolutely necessary that they should all, whatever position they might occupy in the engineering world, be able to "get together." It was essential that the men should be near the masters, and that the masters should be near to men. Class consciousness was drawing them apart; and it must be got rid of. There was nothing wrong with this country. It could recover perfectly well, and be as strong as it ever had been. All the great engineering inventions had come from Great Britain. The fact of the matter was that they were accustomed to doing their job so much better than other people, that when they failed to live altogether up to their own standard, they were apt to criticize themselves to a far greater degree than other nations criticized them. What was needed now was that they should hold together—keep in a solid phalanx—and utilize their resources of brawn and mind. Then they would come out on top once more. The very high rate of taxation at the present time was keeping back the development of industry. ["Hear, hear."] The result of direct taxation such as they were subjected to was that people were not nearly so enthusiastic about putting their whole energies into their work; they felt that they were not going to get the full results of their labours. This was one reason why direct taxation had a bad effect on industry.

SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Association was held on Wednesday, March 30, at the Hotel Cecil, Strand, W.C., under the Presidency of Mr. THOMAS HARDIE, M.Inst.C.E. (Chief Engineer of the Gas Light and Coke Company), who delivered his address. A paper on "Modern Water Gas Plant" was also read by Mr. C. A. Cunnold, of the Nine Elms Works of the Gas Light and Coke Company. There was a large attendance of members.

LUNCHEON.

Previous to the meeting, luncheon was served. The PRESIDENT was in the chair, and among those who sat with him at the top table were Sir David Milne-Watson, LL.D., D.L.; Mr. C. Valon Bennett, of Rochester, Vice-President of the Association; Mr. R. Robertson, of Bristol, Immediate Past-President; Sir Arthur Duckham, K.C.B.; Mr. Thomas Goulden, M.Inst.C.E., Director, Mr. W. L. Galbraith, Secretary, Mr. R. W. Foot, O.B.E., M.C., Assistant General Manager, Mr. F. W. Goodenough, C.B.E., Controller of Gas Sales, and Mr. H. E. Ibbs, Chief Accountant, of the Gas Light and Coke Company; Mr. Frank Prentice, President of the Eastern Counties Gas Managers' Association; Dr. T. Lewis Bailey, Chief Inspector of Alkali Works; Major R. P. Kitson, J.P., Chairman of the Torquay and Paignton Gas Company; Mr. W. T. Dunn, Secretary of the Institution of Gas Engineers; Mr. W. M. Mason, Manager of the British Commercial Gas Association; Mr. J. W. Smith, Secretary of the National Gas Council; Mr. A. Broadbent, President of the London and Southern District Junior Gas Association; and Mr. H. C. Smith, Secretary of the Southern Association.

After the honouring of the Loyal Toast,

Mr. C. VALON BENNETT said it was his privilege to propose the toast of "The Visitors;" and he did so with great pleasure, because they had with them that day a large number of distinguished guests. It was not his intention to mention all the names; but he would like to refer specially to Sir David Milne-Watson, Mr. Thomas Goulden, one of the Directors of the Gas Light and Coke Company, and Major Kitson and Mr. Hooper, Chairman and Director respectively of the Torquay and Paignton Gas Company. Letters of regret at being unable to be present had been received from the following Directors of the Gas Light and Coke Company: Mr. Henry Woodall (Deputy Governor), the Hon. Clive Bigham, Mr. R. M. Holland-Martin, Brig.-Gen. H. Brewer Hartley, and Mr. R. J. N. Neville. He was going to couple with the toast the names of Sir David Milne-Watson and Major Kitson. Immediately the news of the honour that had been conferred upon Sir David became known, the Secretary, on behalf of the Association, sent him their congratulations; but the present occasion afforded him (the speaker) an opportunity of doing so in a more public manner, and of this opportunity he gladly availed himself. [Applause.]

UNBOUNDED FAITH IN THE COMMANDER.

Of every ship that put to sea it was essential that there should be someone in command, and that there should be unbounded faith in that commander. He might liken Sir David to the Commander of the good ship "Gas," and say that they—the members of the crew—had unbounded faith in him. Was he not Skipper of the greatest gas undertaking in the world, and Captain of the National Gas Council, the Federation of Gas Employers, and many other organizations connected with the gas industry? Probably there was no one, when Sir David acceded to the unanimous call to act as Captain of their ship, who thought they would have to weather such hurricanes and storms as had been experienced; but they had chosen well. Their Captain had been on the bridge day in day out, and had steered the ship to safety. Indeed, he believed that, as an industry, they had been greatly strengthened by the troubles through which they had passed. Now the ship had been brought into somewhat calmer water; and there could be discerned in the distance a break in the clouds which gave promise of even brighter conditions to come. They hoped Sir David would be able to give them of his best for many years to come. Doubtless there were many people who did not fully appreciate the magnitude of the undertaking of which he was Governor. The Gas Light and Coke Company had a capital of some 33½ million pounds, they utilized annually about 2 million tons of coal and 31 million gallons of oil, in the production of approximately 50,000 million c.ft. of gas. He was, he thought, right in saying they were probably the largest ratepayers in London and the surrounding area, and that they gave direct employment to a larger number of men than any other company of whatever kind within their gas supply area. He had heard Sir David say he was not a gas engineer; but they all knew that he was a great administrator. As to Major Kitson, in being Chairman of the Torquay and Paignton Gas Company, he presided over a really progressive concern—a concern which had accomplished what very few other companies had been able to do, in taking over from a local authority a gas undertaking, and running it on company lines. This was, in point of fact, one of the best testimonials that any gas company could receive, because it showed the inhabitants knew that they had had a "square deal" in the past, and that they would have good service in the future, at the hands of the Company. He felt sure that Major Kitson would give a great deal of credit to Mr. C. G. Dawson (General Manager and Engineer of the Torquay Gas Company) for the active part he had taken in the work of amalgamation. The Torquay Gas Company possessed works which were well worthy of inspection; and he advised everybody who might have the opportunity of seeing them to take advantage of it.

Sir DAVID MILNE-WATSON, responding, said it was difficult for him to imagine himself as a visitor on this occasion, because he knew most of those present intimately, and some of them very well indeed, so that he was in no way a stranger. He was afraid that Mr. Bennett had referred to his (Sir David's) services to the gas industry in all too flattering terms; but he had no desire to quarrel with him on this account. [Laughter.] At any rate, it was extremely pleasant to hear that what services he had been able to render had been appreciated by the Southern Association. If the Association appreciated what he had been able to do, he in his turn appreciated very highly the work that had been accomplished by the Association. Before the National Gas Council, the Federation of Gas Employers, and other bodies of that kind were formed, the industry had largely to rely upon the work of these Associations; and nobly they did that work. But for them, he was perfectly certain that the industry would not have advanced as it had done. They performed a great amount of "spadework" in the early times. To-day the industry relied very largely upon the various Associations to carry on the technical work, so that their usefulness really remained as great as ever it was.

CONTINUED VIGILANCE ESSENTIAL.

The difficulties they had been through as an industry had been enormous; but he agreed with the proposer that they might now look forward to a somewhat easier time—though none too easy. Though difficulties had been overcome, others cropped up from time to time; and it was absolutely essential that they should remain as vigilant as ever—especially on the technical side. Perhaps the difficulties had altered in their nature. They were now up against competition such as few of them would have dreamed of some years ago; and it was only with the aid of Associations like this that they would be able to hold their own in the fierce fight that faced them. They must keep everything right up to the mark; otherwise they would go under in the competition they were bound to meet in the future. He did not regard competition as at all a bad thing; for it would keep them alive, and bring out the best that was in them. After all, the gas industry had gone on for a hundred years, and had met all kinds of difficulties, and all manner of opposition. He believed that if they applied themselves diligently to the problems that were before them, if they looked ahead and efficiently prepared themselves for the struggle that was coming—particularly with electricity—they would be able to weather the storm with success, and, indeed, to increase their prosperity. It was very pleasant to be there under the ægis of the Chief Engineer of the Gas Light and Coke Company, his very good friend Mr. Hardie. He was extremely glad that Mr. Hardie had seen his way to occupy the chair this year. He had a great deal of work to do and heavy responsibility to carry, and it was only with reluctance that he accepted the Presidency. The fact that he did not shirk it, in view of the many other duties which fell upon him, showed the kind of man he was.

INVITATIONS.

In conclusion, he wished to say that the Directors of the Gas Light and Coke Company would be very glad if the members of the Association would visit their works. Very large extensions and alterations had recently been carried out at the Nine Elms Works, on the other side of the river, which would make them one of the Company's most up-to-date stations. Those of them who knew the works in the old days would hardly recognize them now. The members would no doubt find a great deal there to interest them; and if they would be good enough to go, he provisionally suggested Friday, May 20, as the date for the visit. [Applause.]

Major R. P. KITSON said he regarded it as a very great honour to be asked to join in responding to the toast. As they had been informed, he came from Torquay, where he was proud to be Chairman of the Gas Company—particularly because he happened to be the fourth member of his family who had consecutively occupied this position since the formation of the Company some seventy years ago. He understood it was the custom of the Association to hold yearly a meeting somewhere in the Provinces; and he would suggest that Torquay would be a most suitable place for them to visit next September. On behalf of himself and his co-Directors, he wished to extend to the members a cordial invitation to do so. [Applause.] Among the Directors was a gentleman who was an old friend of those present—Mr. Robert Beynon, who was for many years the esteemed Manager of the Company. They also had a Manager now, Mr. C. G. Dawson, of whom, in his presence, he would say no more than that, like most gas men he (the speaker) had met, he was a very good fellow, and would be delighted to show them over the works. They had within the last few years amalgamated with the Paignton Gas Company; and recently they had taken over the St. Mary Church gas undertaking of the Torquay Corporation—one of the first examples of a company purchasing a corporation undertaking. They were now concentrating the manufacturing operations at the Torquay Works. A good deal of new plant had been installed lately, and more was being put down. Therefore, though they were not very large works, the members would find something to interest them there. They could also, of course, show them some magnificent scenery.

The PRESIDENT said he was sure it would be the wish of the mem-

bers that he should thank Sir David Milne-Watson and Major Kitson for their kind invitations. ["Hear, hear."] There was no doubt they would thoroughly enjoy both the proposed visits, and in each case find much to interest them.

Nothing Succeeds Like Success.

Mr. Thomas Goulden submitted the toast of "The Southern Association," and expressed his great pleasure at being present that day, as it had given him an opportunity of meeting so many old friends with whom he was not now in such close touch as was the case in bygone days. He could in all sincerity congratulate the Association upon the position which it occupied to-day, which no doubt was the effect of the good work that had been done in the past, and was being continued now. This had made the Southern Association what it was—one of the most up-to-date and progressive of all such organizations. Nothing succeeded like success; and the success of the Southern Association was well shown by its membership, which at the present moment was well over 300. This, having regard to the restricted area from which the members were drawn, showed how greatly it was esteemed by gas engineers in the South of England. It compared, if he remembered rightly, with a membership of something like 1100 for the Institution of Gas Engineers, who had the whole of the British Isles to draw upon. He saw from the agenda that the members would later be discussing a very ordinary practical subject; and he thought it was the particular value which attached to the District Associations, that they were able to read and discuss papers on everyday questions with the freedom that came from the acquaintance of those present one with another. The Institution at the present time had to give such papers more or less the go-by. It was therefore left to the District Associations to tackle them, and their doing so added tremendously to the efficiency of the industry. At the Institution meetings, in a limited time, there was much business to be dealt with; and there were the numerous and necessary reports which came from the expert gentlemen who investigated various subjects—all of general value, but which precluded the discussion of matters such as he had referred to as coming before the District Associations.

A Call for General Efficiency.

Efficiency must be the order of the day throughout the gas industry; and it must be a general level of efficiency. The larger and more important undertakings must not be let down by inefficiency on the part of smaller ones. As Sir David had said, the industry would shortly have to meet a tremendous amount of competition. It was competition that had been, and was being, favoured by all political parties, who had made tremendous promises with regard to ameliorating the conditions of the country and improving industrial prospects, and who might therefore be depended upon to move heaven and earth to supply electricity at the cheapest possible rate. They had already undertaken to afford financial backing extending to 33½ million pounds; and it was not likely to stop at that. This was in the form of a loan; but it was really a subsidy to electricity which was going far to help the industry. When this 33½ millions had been spent, and the country was covered with a grid of transmission lines, electricity would be available not only in big urban districts, but in agricultural areas as well. It would cover the face of the land; and it was in the smaller and more remote places that the stress of the competition was going to be most seriously felt. He believed that, in the big cities, with all this expenditure, and the method by which it was to be regulated, there would not be very much economy; but when electricity could be sent into the more remote districts, the smaller gas undertakings would feel competition badly. It was they who would certainly need assistance with regard to their efficiency, and who, he suggested, could be helped by these Associations.

Value of Goodwill.

The storms through which the gas industry had been passing might be said to have had their bright side. It was, indeed, an ill-wind that blew nobody good; and the troubles which had come upon the industry had been met in a manner of which they might all justifiably feel proud. To-day they were reaping the benefit of this. Owing to the efforts of the gas industry, the general public felt hardly at all the inconvenience of the coal stoppage. Gas engineers, with the importation of foreign coal and the various methods they adopted, managed to supply the community with the heat energy for which they asked; and there were spread all over the country thousands of people using gas who, had the coal strike not taken place, would probably not have been gas consumers to-day. The effect of this was being felt in handsome increases in business. Another advantage was that they had created an atmosphere more favourable to gas. Doubtless the bills for this quarter would modify that feeling somewhat [Laughter]; but it would come along again directly. It was all to the good that public feeling should be favourable to them. The industry did a great deal for the public. It did away with the drudgery of domestic life, and was a tremendous help to industry. The community were also benefited by the elimination of smoke. Turning to another aspect of goodwill, he recalled the fact that many years ago, in the early days of profit-sharing, Sir George Livesey read a paper before that Association, in which he put forward as the advantage of the system that it resulted in cheapened cost of production. It did this to a certain extent; but he (the speaker) said at the time—and it had been amply proved to be the case since—that the real value of co-partnership to the gas industry would be felt in times of serious stress. Last year the gas industry was able to carry on when industries generally were in a very disturbed state. It was very much owing to co-partnership that the good feeling which was responsible for this state of affairs existed between employees in the gas industry and those who employed them. While on the subject of a better atmosphere for gas, he would like to make good an omission with regard to the services of Sir David Milne-Watson. One of the greatest services he had rendered to the gas industry had been in placing gas in its proper position in the minds of people in high political places.

Skilled Advice for Small Undertakings.

The need for efficiency was obvious. In the best works efficiency could be improved; and it was up to them all to make the very best use they could of all the scientific knowledge that could be obtained and all the latest results of research. Only a few days ago he was on a visit of inspection to a works which might be said to have been most admirably administered, and which were in charge of a gentleman of whom the highest opinions were entertained. Yet this gentleman, by instituting in one of his retort houses a more complete system of control, thoroughly scientific and up-to-date, had achieved an improvement in working of at least 3 therms per ton. If this could be done in an admittedly well-administered works, what could not be done in the case of the bulk of the small undertakings, which were not able, owing to their financial position, to secure scientific advice? If he went right to the other end of the scale, he could cite the case of a small works—one of the smallest he knew, but still a works belonging to a limited liability company—which he visited not very long ago. Now the works had been amalgamated with a larger company; but at the time he was there, they possessed an exhauster, quite inadequate in size, which was far more often out of action than not. There were condensers which were practically falling down; and the whole place was in much the same condition, though the retorts themselves were in good order, or they would not have got the something under 9000 c.ft. per ton which they were obtaining. It was true that, owing to the condition of the mains, they had a leakage of 25 p.ct.; but in spite of all the drawbacks, and in the absence of any public electricity supply, people were glad to get gas. Indeed, many were clamouring for it who could not get it, because there was not enough being manufactured. This was, of course, an extreme case. But quite apart from the question of amalgamating small concerns which were in the neighbourhood of the larger towns—which would certainly be the best policy to adopt—he would suggest that the smaller undertakings might be formed into groups, and, by pooling their financial resources, secure the services of a trained scientist with a knowledge of gas, who could go round and advise them on the spot as to the conduct of their works. He believed the Association had a "question-box," which was very good in its way; but it could not be of anything like equal value to the advice on the spot of a thoroughly trained man, after an inspection of the actual working conditions in that particular place. If this could not be done, he would suggest a sort of "big brother" movement in which the larger undertakings who had control of a scientific staff would take specified areas into their care, and—he would not say control—advise as to methods of working the smaller concerns. By means of some arrangement of this kind, he thought they might increase the efficiency of these smaller concerns, which were certainly otherwise going to suffer very much from the stress of coming electrical competition.

The President.

Now as to their President, Mr. Hardie. It gave him the greatest possible pleasure to see Mr. Hardie in the chair, and to congratulate the Association upon having placed him there. It was unnecessary for him to say anything about Mr. Hardie—"good wine needed no bush." When he came from the North, they had a sincere regard for him; but since he had been with the Gas Light and Coke Company they had had a great deal more than this—they had all learned to love him. They would be very strange people if they had not. Mr. Hardie had one of the most well-balanced minds of any man he had ever met. He was absolutely free from prejudice, and of unfailing good temper; while with regard to his professional attainments, one had only to look at the work he had accomplished, in collaboration with the engineers of the Company, whose loyal support he enjoyed, to realize that the Gas Light and Coke Company should be in a unique position in the matter of efficient gas manufacture.

The President, responding, said that in thanking Mr. Goulden for his kind references to himself and the work which he had done for the Company, he would like to point out that the work which was now being completed at several of the stations was very largely in being before he took up the reins, and so was due to Mr. Goulden's own foresight. He certainly thought the Association could justly lay claim to have taken its part in furnishing information on technical matters and in assisting the progress of the industry. The members considered a great variety of subjects dealing with the various sides of their work.

Problems to be Considered.

On the manufacturing side, as Mr. Goulden had said, there were always matters relating to efficiency to consider; but it must be remembered that efficiency did not always go with economy, and the first thing they had to do was to supply gas cheaply. All the subjects with which the Association dealt had in view the basic problem of supply of gas at the lowest possible price, and of maintaining the service so as to give complete satisfaction to the consumer. To-day efficiency was frequently bound up with the question of new plant. How best to operate existing plants so that full advantage might be obtained from the installation of more modern plants, when they were required to meet increases in consumption, had to be decided. It was as essential to have a standard of calorific value which would permit of the operation of newer types of plant with full advantage, as it was that the standard calorific value should give the elasticity which permitted of alterations in the operation of the plant to take advantage of changes that took place in the markets for coal and coke. In the distribution department, he did not think they had yet solved the problem of giving at low expense the constant pressure over large areas which they all regarded as so desirable; and in the gas sales department they had to consider the improved efficiency of the apparatus and the cheapest methods of satisfactorily maintaining that apparatus. While he would put perfection of supply before price of gas, it was certain, as had been suggested by the proposer of the toast, that during the

next few years price would become a more important factor; and it was a matter for consideration whether the present costs and the proposed costs for maintenance of supplies might not in the future prove an encumbrance. The removal of naphthalene at the works had eliminated one source of expense on the district; but to what extent it was possible to remove others by attention to quality, composition, and pressure was deserving of very close attention, as was also the form of design of gas consumers' appliances and fittings. The extension of scientific knowledge in recent years had been remarkable; and its application to industry was steadily increasing. The gas industry had not been behindhand in absorbing men with sound scientific training; and there was now a very close application of science to the manufacture of gas. He must say, however, that he would like to see the scientists who had thrown in their lot with them taking a more prominent part in the work of the Association; and he was certain that by so doing they would bring greater distinction to themselves, and their work would be more fruitful than by bringing to the notice of other societies problems that were more immediately concerned with their own industry.

BUSINESS MEETING.

An adjournment was then made to another room, where the business meeting was held; Mr. THOMAS HARDIE in the chair.

CONFIRMATION OF MINUTES.

On the motion of the PRESIDENT, the minutes of the last

Photo. Bacon, Bond St., W.

THE PRESIDENT,
Thomas Hardie, M.Inst.C.E.

meeting, as published in the "JOURNAL," were taken as read, and confirmed.

ANNUAL REPORT.

The report for 1926, as circulated among the members, was also taken as read.

The PRESIDENT, in moving its adoption, said they had heard from the Secretary of the Institution of Gas Engineers to the effect that they were anxious to have more subscriptions to the Benevolent Fund. The Committee, meeting that morning, had decided to increase the donation of the Association for this year; but they were also desirous that those members who were also members of the Institution, and did not themselves subscribe, should consider the matter of supporting the fund.

Mr. L. J. LANGFORD (Tunbridge Wells), in seconding, supported the appeal of the President on behalf of the Benevolent Fund. There were still some members who did not individually subscribe; and it was to be hoped that they would see their way to do so.

The report (which was adopted) included the following items:

In spite of the unprecedented difficulties brought about by the prolonged coal stoppage, it affords your Committee the utmost pleasure to report progress in all branches of the Association's activities during the past year. There has been continued growth in membership; and the papers and discussions have been of the highest order, well maintaining the status of the Association.

The Committee deeply regret to record the death of the following members: Mr. J. F. Braidwood, London; Mr. C. A. W. Codgbrook, Berkhamsted; Mr. J. Fisher, Tottenham; Mr. S. Y. Shoubridge, Eastbourne; and Mr. P. Thomas, Wellington.

The total membership on Dec. 31, 1926, stood at 311.

The audited accounts for the year show a surplus of £7 8s., bringing the credit balance to be carried forward up to the sum of £90 0s. 6d.

EASTERN DISTRICT.

During the year 1926 there have been nine meetings in London, with an average attendance of 34, and one county meeting at Winchester, where the attendance was 31. The special features of the year were the national strike and the coal strike; and both subjects were freely discussed at several of the meetings. There was the usual interchange of information respecting markets of coal and residuals, and much useful information was given and obtained. During the year an attempt was made to arrange for technical discussions on questions raised from time to time by different members; and although several interesting discussions resulted, it was felt towards the end of the year that it was desirable to arrange the subjects of these discussions beforehand, and to announce them on the notice calling the meeting.

Besides the useful discussion on the coal strike, the following subjects were introduced and provided interesting information: "The Seasonal Breakage of Mains and Reinstatement of Roads," "The Removal of Tar Fog," "The Premature Holing of 95 p.ct. Silica Retorts," "Self-Clinkering Grate for Carburetted Water Gas Plant," "The Auto-Operator in Working Carburetted Water Gas Plant." Transcripts of the shorthand notes of the above discussions have been available, and have proved of special interest to those who were unable to be present at the meetings.

The question-box was very freely used during the year; and the following, among other subjects, were dealt with: Reinstatement charges; apparatus fixed without flue; motor transport; prepayment meter charges; charges for gas for power; and coke contracts.

The county meeting, which was held at Winchester, was most enjoyable and useful, although the attendance was somewhat small, due to the wet day; and the thanks of those present were freely expressed to Mr. H. C. Head, the General Manager of the Winchester Gas and Water Company, for his invitation to the works, and for his kindness in showing the members the interesting features of the town.

J. TERRACE, *Chairman.*

WESTERN DISTRICT.

During the year nine meetings have been held, one each at Torquay and Bristol, and seven at Exeter; the average attendance of members at the meetings being 20. Several subjects of importance to the gas industry have come up for discussion; and the exchange of information of a commercial character has been beneficial and valuable to the members present at the meetings during the year, and particularly so during the period of the mining dispute.

At the March meeting, Mr. J. Harger Pye gave a paper entitled "Continuous Verticals *v.* Hand-Charged Horizontals," which was much appreciated by the members present.

The following members were elected as District Officers for the ensuing year:

Chairman.—Mr. J. H. Cornish.
Vice-Chairman.—Mr. W. E. Dean.
Committee.—Messrs. I. Armstrong, C. G. Dawson, S. E. Halliwell, H. Higham, J. Harger Pye, H. E. Riley, C. Stapleton, James Taylor, A. Thomas, H. W. Versey, E. P. Vince, and J. Wesley Whimster.
Hon. Secretary.—Mr. J. B. Cattle.

C. G. DAWSON, *Chairman.*

NEW MEMBERS.

Proposed by the PRESIDENT, and seconded by Mr. C. VALON BENNETT (Rochester), the following new members were elected:

Mr. George Royall Bullwinkle, Commercial Gas Company.
Mr. Warren Barclay, Gas Light and Coke Company.
Mr. Hubert John Escreet, Gas Light and Coke Company.
Mr. Herbert Donald Greenwood, South Metropolitan Gas Company.
Mr. James A. Hepworth, Gas Light and Coke Company.
Mr. Harold Hollings, Gas Light and Coke Company.
Mr. Leonard Lacey, Gas Light and Coke Company.
Mr. Samuel Moore, Burnham-on-Sea.
Mr. Samuel T. P. Perry, Gas Light and Coke Company.
Mr. William James Pride, Blandford.
Mr. John Alexander Rose, Gas Light and Coke Company.
Mr. Edward George Stewart, Gas Light and Coke Company.
Mr. William Howard Wise, Sherborne.

REPRESENTATIVE ON THE INSTITUTION COUNCIL.

Mr. R. ROBERTSON (Bristol) said it had been customary to elect the President for his year of office to represent them on the Council of the Institution of Gas Engineers. He thought the custom was amply justified in the present instance, because their President was eminently qualified to undertake that task. He was a veteran in Council duties, and had a record of which anyone might well be proud of useful work in various capacities in connection with the Institution. He would be welcomed to the Institution; and the Association would honour itself by having him to represent it. Therefore it was a pleasure to submit this proposition.

Mr. Samuel Glover (St. Helens) seconded the motion, which met with the unanimous approval of the members.

Presentation to the Retiring President.

The President remarked that in accordance with a very pleasant custom which had come into existence within the last few years, it was now his privilege to present to the retiring President, Mr. Robertson, a silver salver, as a memento of his year of office. In doing so he would like to express the thanks of the members to him for all the work which he did and for the pleasure which he gave them. The quality of his address and of the papers read at the meetings, together with the very enjoyable visit to Bristol, made Mr. Robertson's year of office a memorable one. ["Hear, hear."] But it was made still more memorable to them by the delightful personality of the President, his rare gift for apt quotations, his literary style, his quiet humour, and his charm of manner—qualities, he was sorry to say, in which Presidents were sometimes found wanting. Turning to Mr. Robertson, who, he said, had, by the qualities enumerated, endeared himself to them all, the President added: "This beautiful salver, which I hand to you with the best wishes of us all, besides being a memento of your year of office, is a token of the esteem and affection which every member of this Association feels for you." [Applause.]

Mr. Robertson thanked the members for the salver and the President for his kind remarks—remarks which were so flattering as almost to make him feel that he was obtaining the salver under false pretences. He had had the loyal support of a capable Secretary, of an enthusiastic Committee, and of all the members; and now, to crown it all, he was handed this beautiful gift. When he undertook the office of President, he did so with fear and trembling; but the experience had proved a very happy one. He thanked them all most heartily—members, Committee, and Hon. Secretary. He wished to pay a special tribute to the Secretary, who had an enormous amount of work to perform. Really, if anyone deserved the salver it was Mr. Smith. "However," added Mr. Robertson, amidst laughter, "what I have I hold."

PRESIDENTIAL ADDRESS

of Mr. Thomas Hardie, M.Inst.C.E.

Gentlemen,—In addressing you to-day, permit me to repeat my thanks for the honour you have done me in electing me your President. I greatly appreciate this honour, and I also recognize the responsibility attached to the position. I shall to the best of my ability endeavour to maintain the standard which has now been associated so long with the Southern Association, but I trust you will treat with indulgence my shortcomings.

The year 1926 will long be remembered in the gas industry. The effects of the industrial trouble upon the finances of gas undertakings are shown very definitely in the balance-sheets recently published, and have been fully described at the annual meetings.

The success of gas-works managements in maintaining gas supplies during a period in which some 8 million tons of British coal would ordinarily have been received, and during which they received practically none, has been generally appreciated and acknowledged. There are, however, a few matters in connection with the loss of our usual supplies of coal which I think are of more personal interest to us as gas engineers and manufacturers, and to which I purpose making some reference.

Before the stoppage, gas undertakings had secured ample stocks of coal which, together with carburetted water gas plants of capacity approaching the consumption of the long summer days, made us satisfied that we could meet a coal stoppage without serious inconvenience and without any great strain upon our resources. As month followed month, however, with no indication of settlement, it was necessary to arrange for supplies of coal from the Continent and America, and to investigate emergency methods of gas production.

Coals for gas-making were obtained from Westphalia, Silesia, Poland, Czecho-Slovakia, Spain, the United States of America, Canada, and India. Particulars regarding most of these coals have already received attention in excellent papers published in the Technical Press. In addition to these, most of you have had your own experiences with one or more of them, so I will not enter into any detail of their values or qualities, or of the satisfactions, disappointments, worries, and anxieties they caused us.

Fortunately the price of oil remained fairly steady throughout the stoppage. The substantially increased demands for this fuel were met without difficulty, and carburetted water gas plants were used to their utmost limit. During the twelve months of 1926, the Gas Light and Coke Company alone used 31,019,589 gallons of oil and 372,421 tons of coke and breeze in the manufacture of water gas—an increase of 9,866,966 gallons and 56,306 tons respectively over the consumption of the previous year.

Value of Water Gas Plants.

The realized advantages of water gas plants have been frequently recounted, but I do not recall an occasion when the satisfaction they give, the security they provide, and the reliability of their operation were so fully proved as last year. I feel sure that these experiences have confirmed the opinion that the provision of water gas plants forms one of the safest bulwarks against difficulties in gas manufacture arising out of disturbances in other industries.

The increase in the proportion of water gas made by the Gas Light and Coke Company during the seven months of the stoppage resulted in a reduction of 354,000 tons of coal in the quantity that it had been expected to carbonize, and I estimate that well over 1¼ million tons were similarly saved throughout the country.

Gas undertakings in the South of England are generally well equipped with water gas plants; the total capacity installed being capable of producing approximately 55,000 million c.ft. in a year. The total output of gas in the area is approximately 135,000 million c.ft. per annum, which incidentally is 50 p.ct. of that of the whole industry.

In the case of some undertakings the increase in the proportion of water gas made was sufficient to absorb the whole of the available coke produced, and instances occurred where coke was purchased from other undertakings. The Gas Light and Coke Company obtained coke-oven coke from the Continent for use in the manufacture of water gas so as to ensure a larger proportion of coke being available for their local customers. The use of this foreign coke was confined to the carburetted water gas plants, as it was not suitable for domestic purposes. In general the analysis was:

Moisture, 8·2 p.ct. (maximum 12 p.ct.).
Ash (dry basis), 11·1 p.ct. (minimum 7 p.ct.).
Volatile matter (dry basis), 1·0 p.ct.
Weight of 1 c.ft. dry, 37 lbs.; wet, 40 lbs.

In the water gas plants good results were obtained, but clinker trouble had always to be reckoned with when using either foreign coke or coke from foreign coal. The clinker was frequently very sticky and had a tendency to climb, and close up the generators. The stickiness made cleaning the fires a matter of considerable difficulty. It was found that, if water were sprayed on the clinker as soon as the fires were spiked, the sudden cooling made the cleaning operations much easier. Though one might have expected cracked cast-iron clinkering doors and fittings from this rather drastic treatment, no trouble was in fact experienced.

Flexibility.

An interesting feature of the combination of the operation of carburetted water gas plants and coal gas plants is the possibility of varying the quantity of gas available for sale from one ton of coal (with the proportionate quantity of oil) from 70 to 250 therms. and the quantity of coke available for sale from 12 cwt. to *nil*.

It does not appear from the quality of the coal and of the coke imported into this country from the Continent that vendors of British coals and coke should experience much difficulty in competing successfully with the Continental products in their home countries; and it is little wonder that Berlin and other German cities have a decided preference for English gas-making coal.

Unloading Steamers.

By the end of November, 1926, the Gas Light and Coke Company were carbonizing an average of 8400 tons of coal per day, an amount which would have been increased to 13,150 tons had no water gas been available. The Company were in a more favourable position than any other gas undertaking for unloading coal—their facilities were, in fact, equalled only by two other unloading installations in this country. Though during the dispute only one half of the new unloading plant at Beckton had been completed, as much as 10,000 tons were unloaded in 24 hours at the two piers; and frequently three ships, each holding 7000 tons of coal, were being unloaded by the cranes at one time. Nevertheless, irregularities in the arrival of the steamers, and their general unsuitability for quick unloading, necessitated some of the ships having to be discharged at Havre, where the coal was transferred to the Company's up-river steamers of 1250 and 1750 tons capacity. Also, some of the ships were unloaded at Messrs. Cory's wharf on the Thames, and others over side direct from the colliers into barges while lying in the river. In many of the steamers the hatchways were too small for large grabs, while the size of the holds, the number of "between" decks, stanchions, and other obstructions, demanded the employment of a considerable number of trimmers. As many as 104 trimmers were employed at one time on a single steamer transferring the cargo to spots where it could be reached by the grabs. In all, 113 ocean-going ships with coal cargoes totalling 660,000 tons were unloaded at Beckton. They were mostly general cargo vessels having up to 8000 tons capacity, a length up to 425 ft., beam 55 ft., and drawing up to 27 ft. of water. Some of the vessels, long past their days of Lloyd's classification, and now sailing under foreign flags, were found to be in such a poor condition that the repairing of trivial grab damage involved expensive constructional repairs. Among the foreign vessels was the one-time renowned British steamer the "River Clyde,"

The use of the Company's own up-river steamers was of much assistance in relieving the strain of unloading at Beckton, where the work was being greatly increased in consequence of all coals having to be received by water instead of the usual proportion of rail deliveries at up-river stations.

GASIFYING OIL AND BITUMEN.

While coal was so costly and so difficult to obtain, efforts were made to secure the benefits of the gasification of oil to an extent beyond the capacity of the water gas plants installed. Both horizontal and inclined retorts were used in the experiments. An attempt to carburet producer gas in retorts partially filled with brickwork did not prove very successful. The injection of oil into a retort with compressed air resulted in much trouble from lamp black formation. The most successful method of oil gasification resulted when oil was injected by steam or allowed to run by gravity into the retorts. With this latter method it was found possible to obtain an output of gas from each retort similar in amount to that obtained when working coal. The gas yield obtained per gallon of oil was just under 1 therm, the quality being about 700 B.Th.U., while the fuel consumption for heating the retorts was 22 lbs. of coke per 1000 c.ft. of gas made.

Under certain conditions the use of bitumen was found to be an advantage; an addition of 5 p.ct. to the coal increasing the quality of the gas made by 50 B.Th.U., and the therms per ton by 7 or 8. Laboratory tests showed that the bitumen yielded over 200 therms per ton in the form of gas having a quality of approximately 1000 B.Th.U. per c.ft. It was not found possible to work with more than 5 p.ct. of bitumen without trouble resulting in the breakers and overhead hoppers in consequence of the low melting-point.

These and other means were undertaken to maintain the supply of gas at full quality to the public, rather than take advantage of the privilege granted by the Emergency Order of supplying, without penalty, gas below standard quality.

FUTURE RESPONSIBILITIES.

I turn now from the difficulties of the past to the responsibilities of the future. The rather colder weather experienced during the first two months of this year compared with last year has caused a heavy demand for gas, in spite of the higher price which is having to be charged to meet the additional costs of the coal stoppage; and the large increases are a warning as to the consumptions that might have to be met with severe weather at the end of December. More convincing figures, however, for showing the popularity of gas and its acceptance by the community as the best agent for all heating purposes are those displaying the steady and increased rate of consumption during the last few years. For the area now served by the Gas Light and Coke Company, the figures were:

Year.	Gas Sold, Thousands of C.Ft.	Increase, Thousands of C.Ft.	Increase, P.Ct. on Previous Year.
1921	36,174,845	..	..
1922	38,086,330	1,911,485	5·3
1923	*39,240,189	1,153,859	3·3
1924	42,596,896	3,356,707	8·6
1925	43,873,490	1,276,594	3·0
1926	45,044,486	1,170,996	2·7

Average annual increase for the period is 1774 million c.ft.

The corresponding figures relating to all statutory undertakings were:

Year.	Gas Sold, Thousands of C.Ft.	Increase, Thousands of C.Ft.	Increase, P.Ct. on Previous Year.
1921	229,077,112	..	..
1922	232,602,789	3,525,677	1·54
1923	241,626,603	9,023,814	3·87
1924	256,891,922	15,265,319	5·95
1925	265,757,353	8,865,431	3·34

Average annual increase for the period is 9170 million c.ft.

COPING WITH THE INCREASE.

The annual increase of 1774 millions of the Gas Light and Coke Company for the last few years necessitates an increase in manufacturing capacity each year of approximately 8 million c.ft. per day. For some years it was possible to meet these increases from surplus plant and by increasing the output of existing plant. Most of the surplus plant in existence has now been reconstructed and put again into operation, and most of the existing plant has been tuned up to its maximum output. Larger furnaces, higher and more regular temperatures in the retort settings, and more efficient control have all provided their quota towards the larger output from individual units of retort house plants. At the same time alterations to water gas plants have resulted in increased outputs up to 100 p.ct.

Considering, for example, the returns relating to seven of the stations of the Gas Light and Coke Company, I find that the average daily output from each retort in operation of the horizontal and inclined settings has increased as follows:

Year.	C.Ft. per Retort per Day.
1900	11,300
1910	12,800
1920	14,600
1925	16,100

Before giving you particulars of some of the reconstruction work that has recently been undertaken, I might remark that my Company have had reports from their representatives, who have from time to time visited the Continent and America in search of information, as to the lines of progress that have been found most advantageous in other countries. Installations of coke ovens have received particular attention, and are still being given careful consideration, as under certain conditions, particularly for large installations, they may have advantages over other types of carbonizing plant. It has not yet been possible, however, to show a balance sufficiently favourable to justify the installation of this type of retorting plant in the Gas Light and Coke Company's area when all the conditions, in regard to both erection and working, are taken into account for specific instances. Other conditions, however, may easily throw the balance in favour of coke ovens; and when these arise I shall have no hesitation in recommending this method of carbonizing to the consideration of my Directors.

RECONSTRUCTION PROBLEMS.

The amalgamation with the Brentford Company brought the number of our manufacturing stations in regular work up to thirteen; and the choice of the station at which new plant shall be installed is sometimes difficult. With manufacturing stations varying in size between 1½ millions and 100 millions in

TABLE I.

Type of Plant.	Inclined.	Horizontal.	Continuous Verticals.
Size of retort house	310 ft. by 63 ft.	360 ft. by 100 ft. (65 ft.)	192 ft. by 60 ft.
Number of retorts	240	270	128
Size of retorts	24 in. by 14 in. by 20 ft.	24 in. by 18 in. by 23 ft.	33 in. by 10 in. to 39 in. by 25 in.
Power	Steam	Electric	Electric
Coal	Midland	Durham	Durham
Coal per month (average)	9200	14,400	12,400
Coal per full day	306	480	400
Charge per retort	9·2 cwt.	19·5 cwt.	3·4 tons per day
Duration	8·5 hours	12·0 hours	..
Coal per retort (working) per day	1·3 tons	1·95 tons	3·4 tons
Therms per retort (working) per day	94·9	140·4	265·2
Therms per ton	73	72	78
Therms per day	22,338	34,560	31,200
C.ft. per day	4,150,000	6,250,000	6,120,000
Average of retorts gas-making	235	246	117
Area of site, sq. ft.	19,500	36,000 (23,400)	11,520
C.ft. of gas made per 24 hours per sq. ft. of site.	212·8	173·5 (267·1)	531·2
Therms " " " " "	1·15	0·96 (1·48)	2·71

CARBONIZING WAGES, PENCE PER TON OF COAL CARBONIZED.

Coal (from delivery to crushers to bunkers)	1·75	0·54	0·42
Carbonizing (coal from bunkers to coke to conveyors and furnaces)	23·79	11·12	11·18
Coke (coke from retort house to storage in bunkers)	16·00	0·93	1·04
Incidentals (foremen, lobbies, &c.)	3·54	3·31	3·29
Total wages	45·08	15·90	15·93

NOTE.—The above retort house now fitted with continuous verticals was originally an inclined retort house making 2 million c.ft. of gas per day.

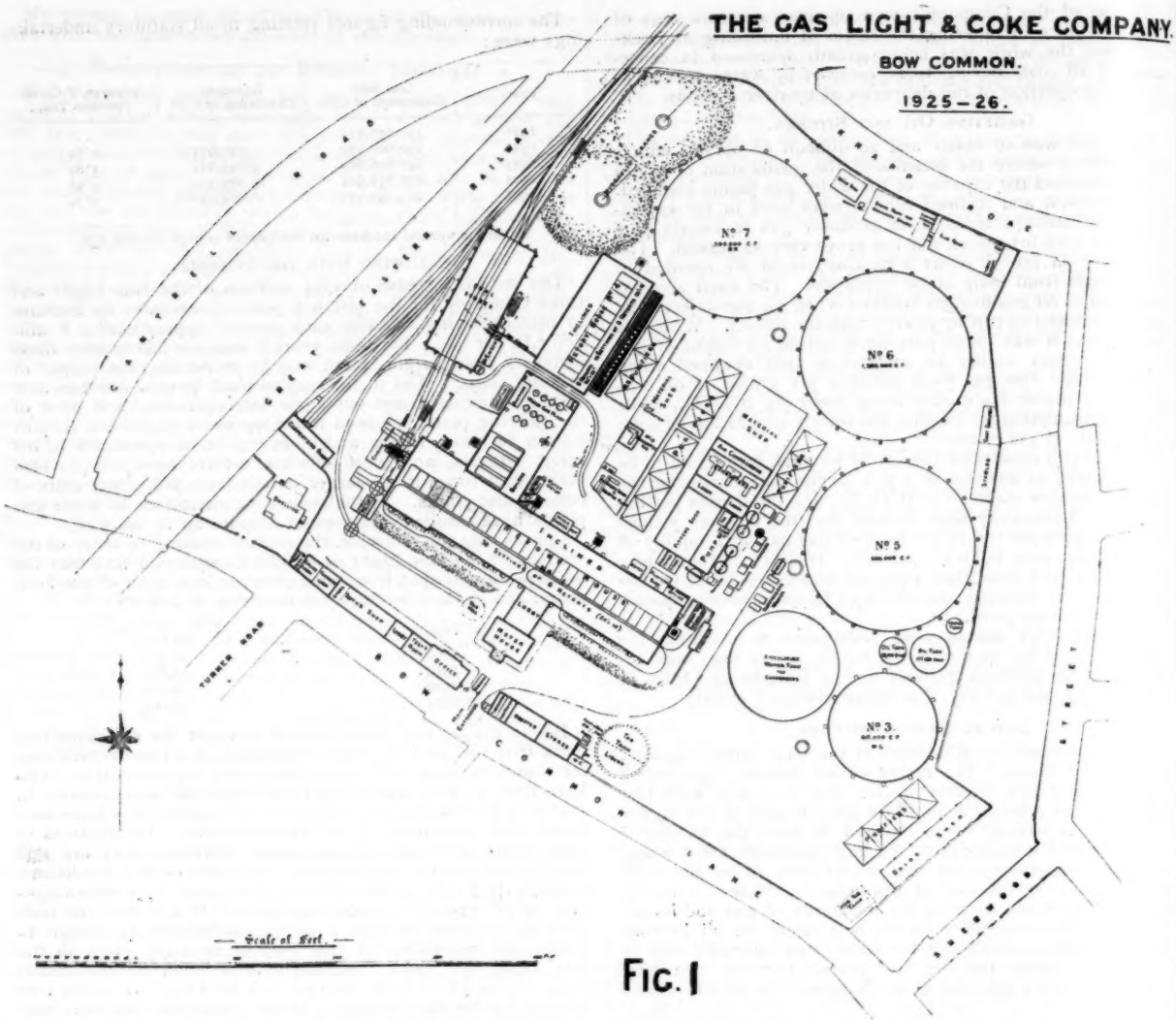


FIG. 1

daily output, differing greatly in their facilities for receiving coal, and in the demand of the districts surrounding them for coke, the difference in the net coal cost of manufacture between station and station is considerable. The type of carbonizing plant alone has not the most important influence on manufacturing costs. Reconstruction is only undertaken when the existing plant has reached the end of its economical and efficient life, and considerable expenditure on repairs has become essential. In Table I. will be found a comparison of the results obtained in three representative types of retort house plant.

It will be seen that there is little difference in the labour costs of a modern horizontal retort house and of a present-day vertical retort plant; and the reason which has led us to adopt vertical retorts in several of our recent reconstructions has been mainly the necessity of obtaining the largest possible output of gas upon a given ground area. We have not found that any one vertical retorting system possesses sufficient outstanding features to justify our exclusive choice; and as each reconstruction involving the use of vertical retorts becomes due, the selected plant results from the best tender submitted. To date the vertical retort plant of the Gas Light and Coke Company consists of 14 million c.ft. per day each of the Glover-West and the Woodall-Duckham designs. In the comparison given in the table, though the horizontal retort house is 100 ft. wide, yet the same output could have been obtained had it only a width of 65 ft. and the comparative therms per square foot per day would then have been 1·48 as against 2·71 with vertical retorts. In a house specially constructed for vertical retorts, the figure 2·71 would be improved.

Alterations at the Bow Common Works.

As an example of reconstruction work, I propose to give you some particulars of the alterations which are now being made at Bow Common. This case is a simple one, as the completed works will have but a single retort house, whereas at other stations the reconstruction has resulted in a portion only of the carbonizing plant being renewed.

The Bow Common Works were originally the manufacturing station of the Great Central Gas Consumers' Company, and were erected in 1851. The works came into possession of the Gas Light and Coke Company in 1869, at which time the annual output was 465 million c.ft. The works are unique in being situated in the area of supply of another Gas Company, and the gas made there has to be sent 1½ miles before distribution. The works are directly connected with the Beckton high-pressure 48-in. trunk mains. Fig. 1 is a plan showing the arrangement of the works before reconstruction. There were then two retort houses—No. 1, 310 ft. by 63 ft., containing 240 inclined retorts 24 in. by 14 in. by 20 ft., and No. 4, 128 ft. 9 in. by 57 ft., with 88 inclined retorts 24 in. by 15 in. by 20 ft. Manufacturing results were exceedingly good; the therm yield being in the neighbourhood of 73 per ton of coal. In consequence of the works having no connection to river or canal, all coal is delivered by rail, and is generally obtained from Yorkshire and the Midlands. The benches were respectively 32 and 25 years old last year, and, in spite of the results then being obtained, were in such a condition as to demand major renewals. After consideration it was decided to remodel entirely the works, and effect reduction in certain of the operating charges, which were above the average of the other stations. As a result of last year's industrial disturbances, the new works are not yet in operation, and therefore I am unable to inform you, as I had hoped to do, to what extent we have been successful in our objectives.

With the inclined retorts the daily output of coal gas was 5·5 million c.ft., which, together with the carburetted water gas plant, produced a total output of 8 million c.ft. per day. As now reconstructed the output is made up of coal gas from vertical retorts, 8 million c.ft., and carburetted water gas 2·5 million c.ft.—a total output of 10·5 million c.ft. per day (500 B.Th.U.).

The reconstructed plant, together with gasholder storage of nearly 4,500,000 c.ft., coal storage equal to 30 days' maximum consumption, 14 days' coke storage, Engineer's residence, and all the usual appurtenances of a gas-works, occupies 9·5 acres, so that the area per million c.ft. is 0·905 acre. This is the fourth of the Company's stations wherein the acreage per million is less than one. It will be recognized how necessary it is in London, where suitable sites for gas-works are to-day practically unobtainable, that the greatest possible use should be made of every favourably situated existing site.

New Arrangement of the Works.

The arrangement of the works subsequent to reconstruction is shown in fig. 2. It will be noticed that all the carbonizing

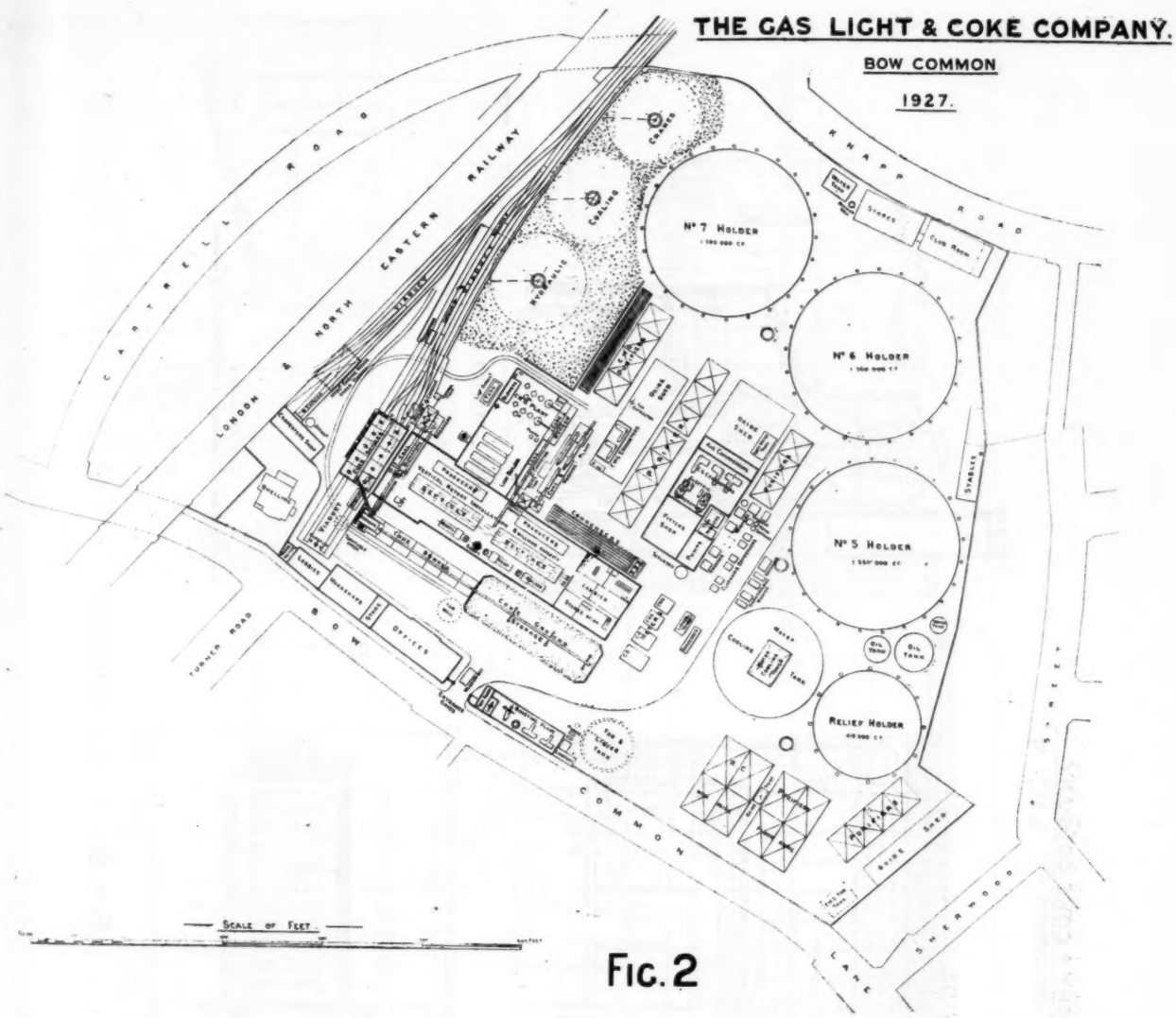


FIG. 2

plant has been concentrated in a portion of the No. 1 retort house, 213 ft. in length—the remainder of the house being used for a stores on the ground level—while lobbies and bath-rooms have been constructed above. The second retort house has been demolished to make room for further coal storage, and an additional section of purifiers has been erected. The carburetted water gas plant, which consists of two Humphreys & Glasgow sets, each 1¼ million c.ft. capacity, was erected in 1919-20, and remains untouched, as also do the main Lancashire boilers. Much of the washing, purification, and naphthalene extraction plants were in first-class condition, and needed no renewal. The exhauster room has been entirely remodelled, electrical plant has been added to the works equipment, and cooling plant for circulating water has been installed. The completion of the scheme will also cover the provision for further gas pumping plant, and new offices, laboratories, and workshops.

Carbonizing Plant.

The carbonizing plant is illustrated in fig. 3. It consists of an installation of Woodall-Duckham vertical retorts in two benches each of 34 retorts. The retorts are 25½ ft. long, rectangular in section, 78 in. by 10 in. at the top and 81 in. by 18 in. at the base. Each retort is capable of dealing with 7·53 tons of Yorkshire coal in 24 hours, and the carbonizing capacity of the plant is 512 tons daily, from which is guaranteed a yield of 8,038,000 c.ft., or 40,960 therms of 510 B.Th.U. gas. The make of gas per ton is thus 15,700 c.ft., and the therms are approximately 80 per ton of coal carbonized.

The heating of the retorts is carried out by two batteries each containing five producers erected independently of the retort bench at one side of the retort house and feeding the settings by a common producer gas main running the length of the benches.

No regenerators are installed, but there are three waste-heat boilers. Two of these are normally in action, leaving the third as a stand-by, so that a full output of steam is always assured during periods of cleaning or repairs to one of the boilers. The guaranteed consumption of fuel is 2·8 cwt. of cold coke per ton of coal carbonized, while the water evaporation from the boilers should be not less than 5·45 lbs. (from and at 212° Fahr.) per lb. of producer fuel.

After allowing for the steam used by the turbines driving the induced draught fans, the net output of steam at 130 lbs. per sq. in. and 500° Fahr. should be 31,800 lbs. per hour, which is equal to 1490 lbs. per ton of coal carbonized.

The area occupied by the new carbonizing plant is now 13,420 sq. ft., giving an output of 600 c.ft., or 3·06 therms per sq. ft. of ground space, which compares with 212·8 c.ft. and 1·15 therms of the inclined retorts previously installed in this retort house.

One of the principal objects aimed at in the reconstruction was to secure the maximum benefits from the mechanical handling of coal and coke. The arrangements for the reception, unloading, and storage of coal, and for the transport of coke to consumers' rail and road vehicles and for works use form, together with the conveyors of the vertical retort plant, a complete scheme for each material.

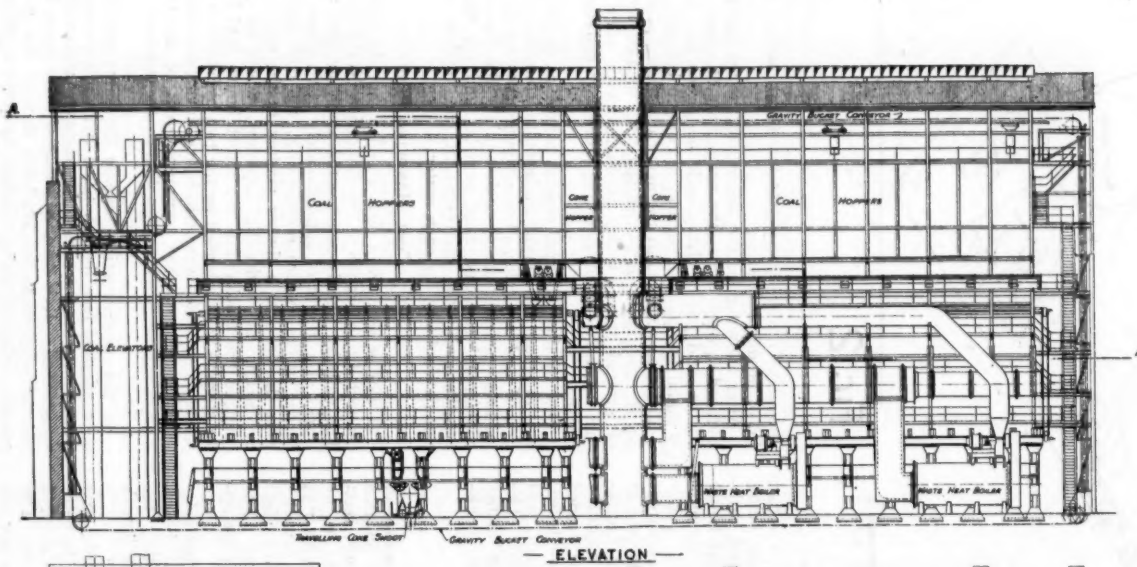
Coal Handling Plant.

It will be seen from figs. 1 and 2 that the works are directly connected to a branch of the London & North Eastern Railway. The railway line is constructed upon arches, and passes the works at a height of approximately 13 ft. above the yard level. In the works, before remodelling, the coal trucks as received were drawn over a timber viaduct to the end of No. 1 House by means of hydraulic capstans, where an end tipper discharged the trucks into the retort house coal breakers. Coal for storage was unloaded by the two hydraulic cranes of 70 tons per hour capacity each, which are elevated on brickwork pedestals situated near the commencement of the viaduct sidings. The hydraulic pressure supplied to these cranes is 730 lbs. per sq. in.

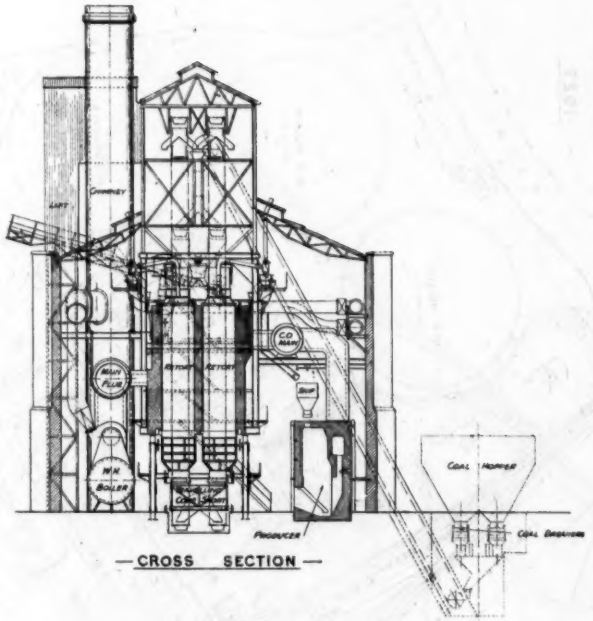
In the reconstruction scheme the same general method has been adopted (see fig. 2). The hydraulic cranes and the capstans have been retained for storage, and a third crane has been added. It is arranged that storage room for 15,000 tons of coal shall now be available around the pedestals of the cranes. The old timber viaduct has been extended by the addition of another line of track, which, together with the whole

— THE GAS LIGHT & COKE COMPANY. —

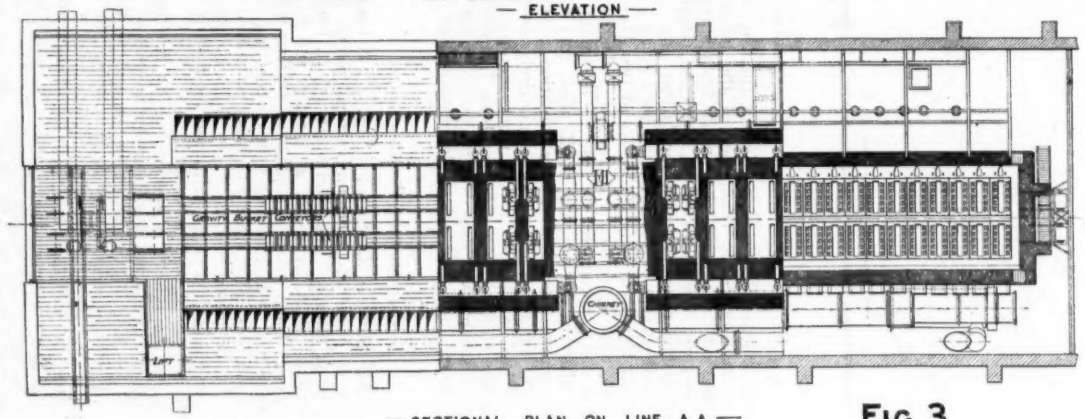
— BOW COMMON. —



— ELEVATION —



— CROSS SECTION —



— SECTIONAL PLAN ON LINE A.A. —

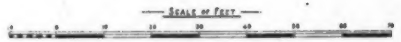


FIG. 3.

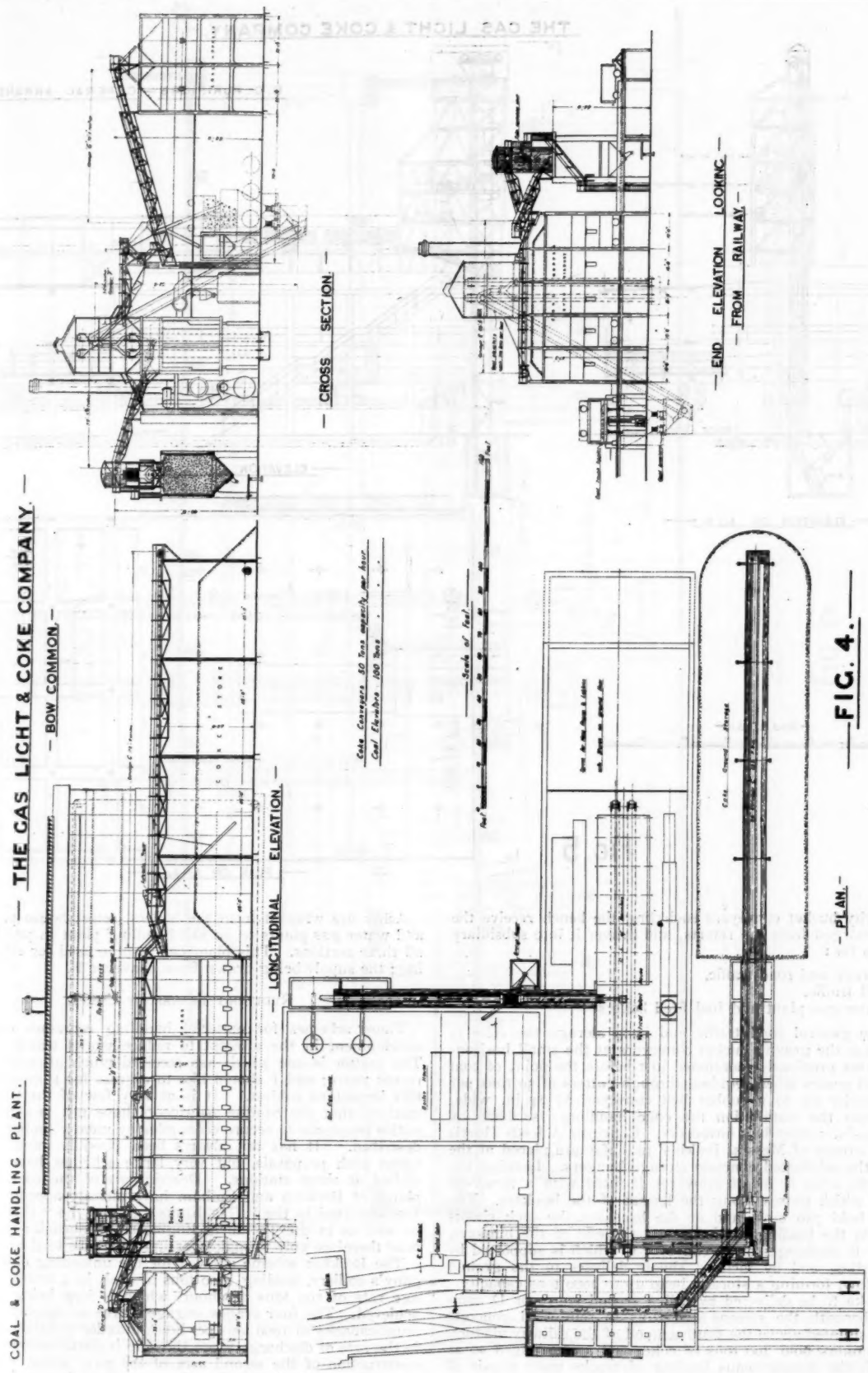

— THE GAS LIGHT & COKE COMPANY. —
— BOW COMMON. —
COAL & COKE HANDLING PLANT.
— LONGITUDINAL ELEVATION. —
— CROSS SECTION. —
— END ELEVATION LOOKING FROM RAILWAY. —
— PLAN. —

FIG. 4.

of the renewed portion of the viaduct in the neighbourhood of the tippler and the retort house, has been constructed in reinforced concrete. The sidings are now arranged to give room for receiving and manipulating a full train of coal trucks while an empty coal train and a reasonable number of coke trucks are also on the rails.

The coal trucks are unloaded by a Mitchell tippler having a capacity of 12 trucks per hour, each holding 12 tons of coal. The tippler discharges in a steel receiving hopper of 50 tons capacity. From this point the coal handling plant is in duplicate. There are two single-roll breakers and two bucket elevators of 105 ft. centres. They have each a capacity of 100 tons per hour, and discharge into either of the two small horizontal traverses arranged in the rising end of each of the two gravity bucket conveyors encircling the retort benches as shown in fig. 3. These gravity bucket conveyors also have a capacity of 100 tons per hour each when transporting coal, and can be used independently or simultaneously for coal and coke. The coal, after a short vertical rise, passes horizontally along the length of the house, and is tipped into the bunkers which have a capacity equal to 48 hours' demand of the vertical plant.

Coke Handling Plant.

The arrangement of the coke handling plant is shown in fig. 4.

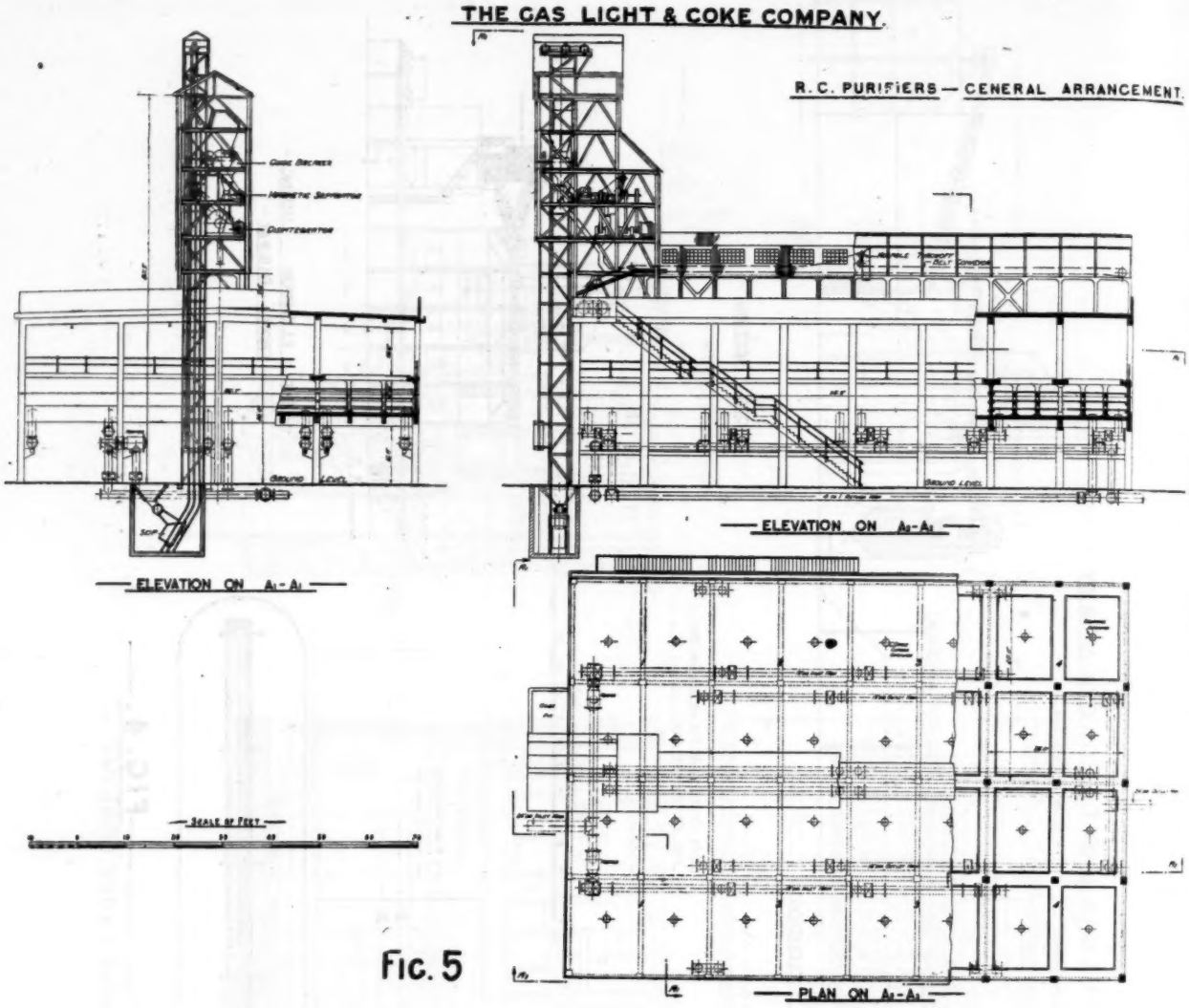


Fig. 5

The gravity bucket conveyors encircling the bench receive the coke discharged from the retorts, and deliver it into subsidiary conveyors for:

(1) Storage and road traffic.
(2) Rail traffic.
(3) Water gas plant and fuel fired boilers.

For the general road traffic and heap storage the coke is tipped from the gravity bucket conveyors at the small horizontal traverses previously mentioned just before the point of coal entry, and passes when required through cutters of 50 tons per hour capacity on to a rubber belt conveyor A, 24 in. wide. Throughout the installation the coke handling is done by similar 24-in. rubber belt onvecyors. Conveyor A feeds Harris vibrator screens of Messrs. Jenkins' manufacture placed at the head of the reinforced concrete storage bunkers. Leaving the screens the coke is fed to conveyor B fitted with a throw-off carriage which passes along the length of the bunkers. The bunkers hold 750 tons, and at the base are the sack shoots leading to the loading platform. At the end of the bunkers, conveyor B discharges on to conveyor C which is supported by steel trestles, and by inclined shoots delivers to the ground 40 ft. below, forming a storage heap up to 2000 tons capacity.

For coke to be delivered by rail a second conveyor D commences beneath the screens and runs to reinforced concrete bunkers situated above the southern end of the railway viaduct. These bunkers hold 400 tons of coke, and are arranged so as to permit the simultaneous loading of trucks upon a pair of parallel tracks beneath.

For the water gas plant it is necessary to pass the coke along a section of the gravity bucket conveyor normally used for coal, where it is tripped into conveyor F feeding bunkers of 100 tons capacity above the water gas house. The same conveyor can also discharge into a breeze bunker of 40 tons capacity for the supply of fuel to the Lancashire boilers.

Fuel to the retort producers is tripped from the gravity bucket conveyors into two bunkers contiguous with the main coal bunkers situated at the central ends of the benches. Shoots from these bunkers are used to direct the coke into skips travelling over each section of producers.

Ashes are wheeled from the boilers, retort house producers, and water gas plants to an ash handling plant in proximity to all three sections. This plant can also be used for coke washing; the supply being drawn from conveyor F.

Reducing Transport Costs.

These schemes for material handling represent our latest development in the attempt to reduce works transport costs. The matter is one which has received much attention during recent years; and I should like to digress for a moment upon this important subject. It is at very few of the Company's stations that the Station Engineers have not brought to my notice proposals to secure economies by means similar to those described. It has not always been possible immediately to adopt such proposals, but very large schemes have been installed at three stations. Descriptions of the coal handling plants at Beckton and Fulham have already appeared during the past year in the "Gas Journal" and the "Gas World," as well as in the Technical Engineering Journals; and I propose therefore only to make passing reference to them.

The Beckton scheme allowed for the unloading of the Company's colliers, holding 2800 tons of coal, in 4 hours—an average rate of 700 tons per hour, which is now being regularly achieved. The four cranes engaged have an aggregate maximum capacity of 1000 tons per hour, in order to balance the drop in the rate of discharge when the ship is partly unloaded. The construction of the second arm of the pier, which will enable two colliers to be handled at the same time, is now in hand.

The Fulham scheme was designed for the rapid handling of the Company's up-river colliers holding 1800 tons of coal. Two cranes unload these steamers at a maximum rate of 250 tons per hour. In each scheme the coal when landed is handled by means of rubber belt conveyors; and we are satisfied with the economies effected and the facilities for working obtained with this method of material handling.

As an example of economies effected, I give a comparison of some actual costs of unloading colliers and transporting the coal to retort houses at Beckton in the case of the old and the new piers and their respective railway arrangements. Both

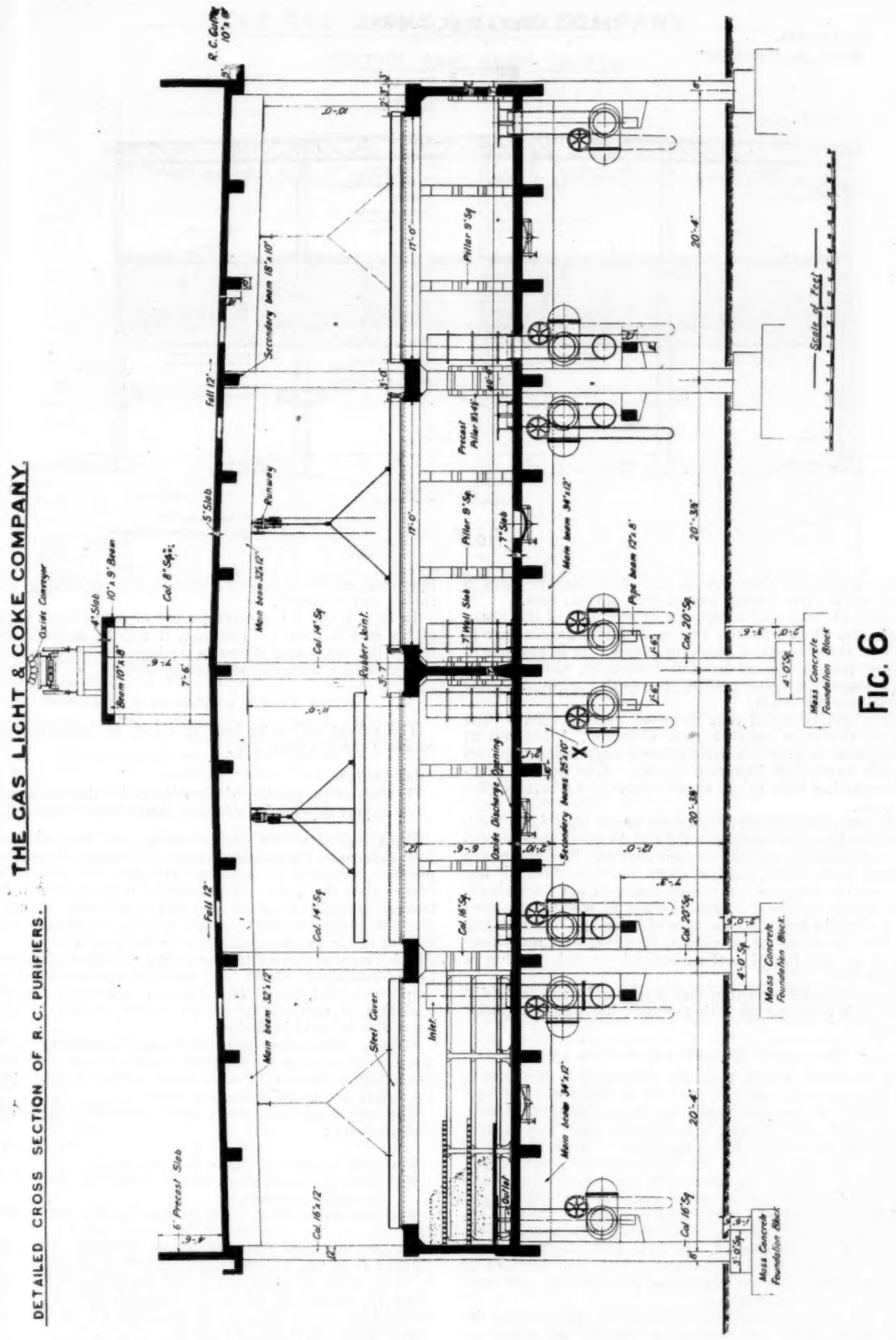


FIG. 6

piers continued at work together during the coal stoppage, and the comparisons are contemporary.

TABLE II.

Pier	Old	New	Old	New	Old	New
Steamship	X	X	Y	Y	Z	Z
Type	abnormal ship		collier engines aft		collier engines amidships	
Tons cargo	6805	6362	2722	2706	3861	3762
Time discharge, hrs.	61'5	33'5	16'0	5'0	32'0	10'25
Men × days	402	170	64	40	209	60
Cost per ton	1s. 2·75d.	5·75d.	5·67d.	2·23d.	8·1d.	2·7d.
Average rate of discharge, tons per hour	111	190	170	541	122	368
Saving in unloading cost by new pier (per ton of coal)	9d.		3·44d.		5·4d.	

Where it is necessary to unload over week-ends or other periods of increased wages, these savings will become :

X.	Y.	Z.
1s. 0·5d.	4·5d.	5·26d.

It is also to be noted that the time saved in unloading has a great value in increasing the number of voyages as well as the capacity of the unloading plant over a period, while considerable economies in maintenance have also been effected. The new plant has not been at work for a sufficient period to justify the publication of the savings in maintenance costs that appear to have been achieved.

Rubber Belts for Coke Handling.

The use of rubber belts for the handling of coke is favoured wherever they can be arranged to suit the conditions. At Beckton a belt installed at the recommendation of Mr. W. B. Leech

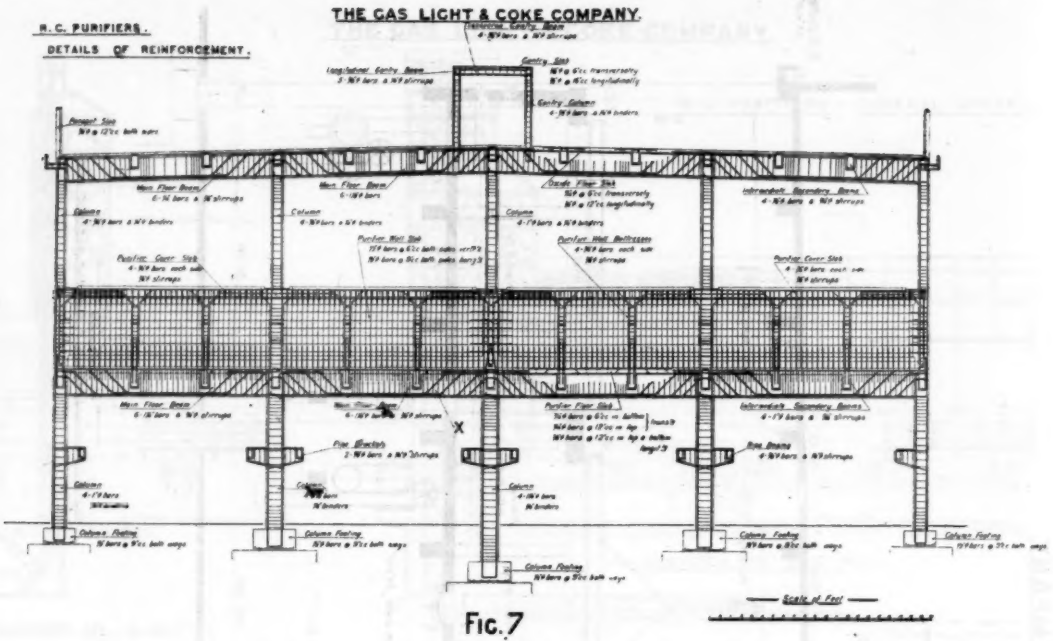


FIG. 7

for the distribution of coke over a line of storage hoppers is still in full work after having passed over 240,000 tons.

The quality of belts and sufficiency of strength of the structural work are, of course, the two most important factors in the design of these material handling plants. It is also essential that the motors should be of full capacity, with gearing of ample strength and good design, if smooth running and low maintenance are to result.

Though it will be noted that throw-off carriages have been provided on the coke belts at Bow Common, I am not at present prepared to give this arrangement unqualified approval until further experience has been gained. Our general practice in the past has been to use shuttle conveyors wherever possible for coke.

For hot coke conveyors (excluding the warm coke from vertical plants) we have generally adopted the drag-bar type of conveyor in preference to telphers or transporters. The chain was standardized some years ago in width and pitch for all our stations, and the supplies are mostly made in our own shops. These conveyors average a length of chain of 400 ft.; the average life of a chain being 70,000 tons of coke and breeze transported. The maintenance of chains, troughs, and machinery amounts to 4d. per ton of coal carbonized, or 6½d. per ton of material carried.

The matter of coke screening and washing I propose to discuss later, as it is bound up with aspects other than the purely mechanical.

Reinforced Concrete Purifiers.

Much of the plant at Bow Common remaining undescribed is of a type familiar to you all and need not be detailed. The new purifiers, however, are somewhat uncommon in being almost entirely of reinforced concrete construction and fitted with a simple and efficient oxide handling plant. This method of construction has not received the unanimous support of gas engineers; but provided the essentials are given careful and adequate consideration in the preparation of the design and the execution of the work, there appears to be no physical objection to the use of concrete, while in addition considerable savings in cost can be effected. In 1925 I obtained comparative prices for cast-iron and reinforced concrete purifiers of exactly equal sizes, and the reinforced portion cost only two-thirds of its metal counterpart.

In order to effect the maximum economy in ground space for purifying plant, it is our practice to design the boxes for bottom discharge of oxide; the material then being elevated to the flat roof of the plant, which forms the revivifying floor. Details of a typical purifier installation of our standard type and similar to the design being prepared for Bow Common are shown in figs. 5, 6, and 7.

The use of bucket elevators for oxide has disadvantages; and we are at present experimenting with installations fitted with an automatic skip hoist, by means of which the oxide is loaded, elevated, and discharged, and the empty skip returned continuously without the attention of an operator. This type is shown in the illustrations.

At the head of the elevator or hoist, the oxide is discharged into a receiving hopper feeding through a crusher on to a magnetic separator for the removal of tramp iron likely to damage the disintegrator, into which the material is then fed. This machine reduces the oxide to the required degree of fineness, following which it is distributed to the revivifying floor by a rubber belt conveyor.

In figs. 5 and 6 the arrangement of connections for the flow of the gas is shown. The gas, it will be noticed, enters the top of the boxes and descends through the oxide to the bottom in accordance with our standard practice.

Salient Points in Concrete Construction.

The salient points to bear in mind, in connection with the concrete construction, are:

(*a*) Design.
(*b*) Correct proportion of ingredients for the concrete.
(*c*) Expert supervision of the construction of the work.

With regard to the first of these, the designer must carefully determine the stresses which are likely to occur from every possible condition of loading; and for this reason he must ensure that the boxes are capable of withstanding a hydraulic test on completion, an air test when the boxes are empty, and also the strain introduced under working conditions due to the weight of the oxide combined with the gas pressure.

The forces set up by these varying conditions impose a number of combined, direct, and bending stresses which must be amply provided for. The designer must also determine the variation of temperature which occurs, to which due regard must also be paid in design.

Having determined the thickness of concrete required, the question of placing the concrete in the moulds so as to ensure the absolute absence of voids must receive careful attention if the boxes are to be made gas-tight.

The safe working stresses which we adopt for purifier construction are:

For steel in tension, 16,000 lbs. per sq. in.
For steel in compression, twelve times the stress in the surrounding concrete.
For concrete in direct compression, 750 lbs. per sq. in.

If, for instance, we take as an example the main beam marked X in fig. 7, the maximum load is 45 tons. The beam is 12 in. wide by 34 in. deep, and the steel reinforcement provided for tension is six 1⅛ in. diameter steel bars which are stressed to 15,800 lbs. per sq. in., and the concrete stress in compression is 416 lbs. per sq. in.

With regard to the second point—viz., the mixture of the concrete—the proportions of ballast, sand, and cement adopted for the boxes are in the ratio of 2 : 1·2 : 1. For the remainder of the structure such as columns, roofs, &c., the mixture used is in the ratio of 3 : 1½ : 1.

The third point is the actual construction of the work; and too much care cannot be exercised in ensuring that this most important step is efficiently carried out. The ideal method when the concreting of the purifier boxes has been undertaken is to arrange for the work to be continuous day and night from the commencement of the placing of the concrete until the boxes are finished. Where it is necessary to make joints in the concrete, special treatment of the work must be made to provide an adequate bond of the new concrete with the set concrete.

If the above points are given due consideration by engineers, there should be no difficulty in adopting this form of construc-

THE GAS LIGHT & COKE COMPANY.

CONTROL TEST ROOM CHARTS.

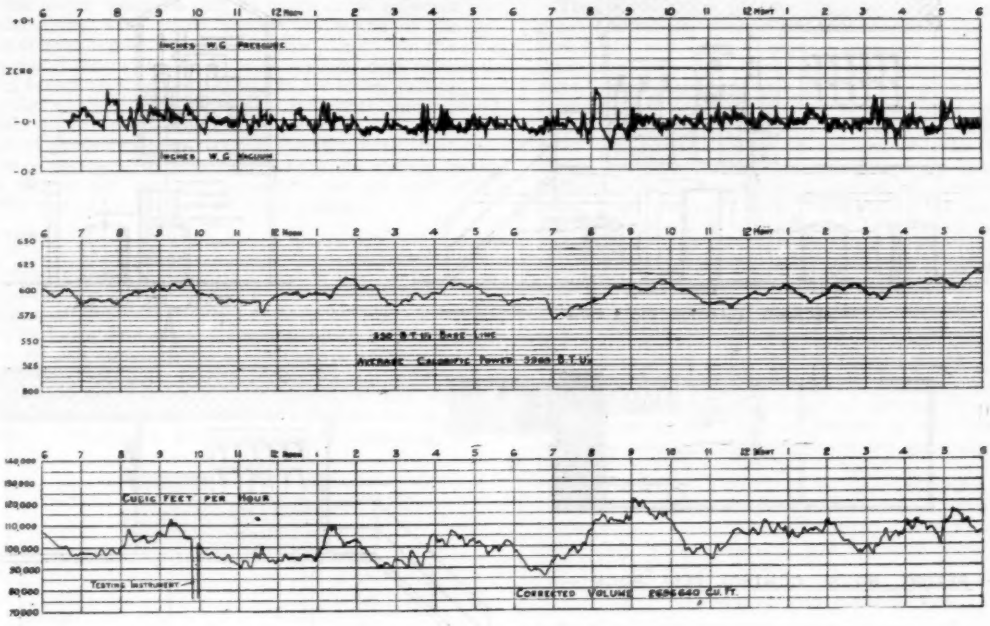


FIG. 8.

tion with satisfaction for purifying plant and for boxes of about the size illustrated, with a saving in cost.

Costs.

As may be expected, the carrying-out of several of these reconstruction schemes has placed the Company in the possession of data as to present-day gas-works construction costs; and I give in Table III. some averages of costs which, while being definitely applicable to extensions of 5 to 7 million c.ft. per day, will, I hope, be of more general value.

TABLE III.—*Costs of Reconstruction of Existing Works, Including Foundations, Contract and Direct Labour, and Connections.*

COAL GAS PLANT.

—	Per Million C.Ft. per Day.	Per Ton of Coal per Day.
	£	£
Carbonizing plant and waste-heat boilers	16,100	249·6
Condensers	1,290	20·0
Exhausters	650	10·1
Livesey washers	190	2·9
Ammonia washers	1,050	16·3
Naphthalene washers	520	8·1
Purifiers with oxide handling plant	5,100	79·0
Station meters	900	13 9
Electric power plant	1,300	20·2
Coal unloading plant	1,700	26·4
Coal handling and storage plant	1,420	22·0
Coke handling plant	1,620	25·1
Mains, services, and cables	2,600	40·3
Tar and liquor storage	1,300	20·2
Ash handling plant	840	13·0
Gasholders (12 hours' make)	9,300	144·2
	£45,880	£711·3

More Efficient Working.

There has been reached in recent years a greatly improved standard of operation in gas-works. More efficient working is general, and greater attention is now given to detail than at any previous time. The employment of chemists in large numbers has assisted in concentrating attention upon sources of loss which are now avoided; and the scientific control of working results in increased efficiency.

The more careful examination of coals has led to a greater accuracy in discrimination. While colliery owners no doubt recognize fully the need for efficient means of cleaning coal, they still continue to deliver many varieties with excessive quantities of ash; and it may be that the increasing demand for coke for domestic purposes will make it essential for gas undertakings themselves to instal one or other of the cleaning processes which are each year becoming more and more effective and more easily applicable.

Retort House Control.

Systems of retort house control giving better command of the quality of the gas produced are being extended. A system introduced at our Southall Works by Mr. J. S. Thorman may be cited as one of the most complete installations we have adopted. This plant was installed with the purpose of obtaining from many varying classes of coal the maximum thermal yield in the form of gas per ton of coal, with a minimum expenditure of fuel for retort heating. The retort house foreman has before him continuous records of the calorific value, gas volume, inerts, and vacuum, which enable him to detect immediately any irregularities in working and the effects of any alteration in the quality of the coal. At the same time his own work is completely checked.

The apparatus is installed in connection with an inclined retort house making 2¾ million c.ft. of gas per day. The control room, which is situated adjacent to the retort house stage, is illustrated in fig. 9. It contains the following instruments:

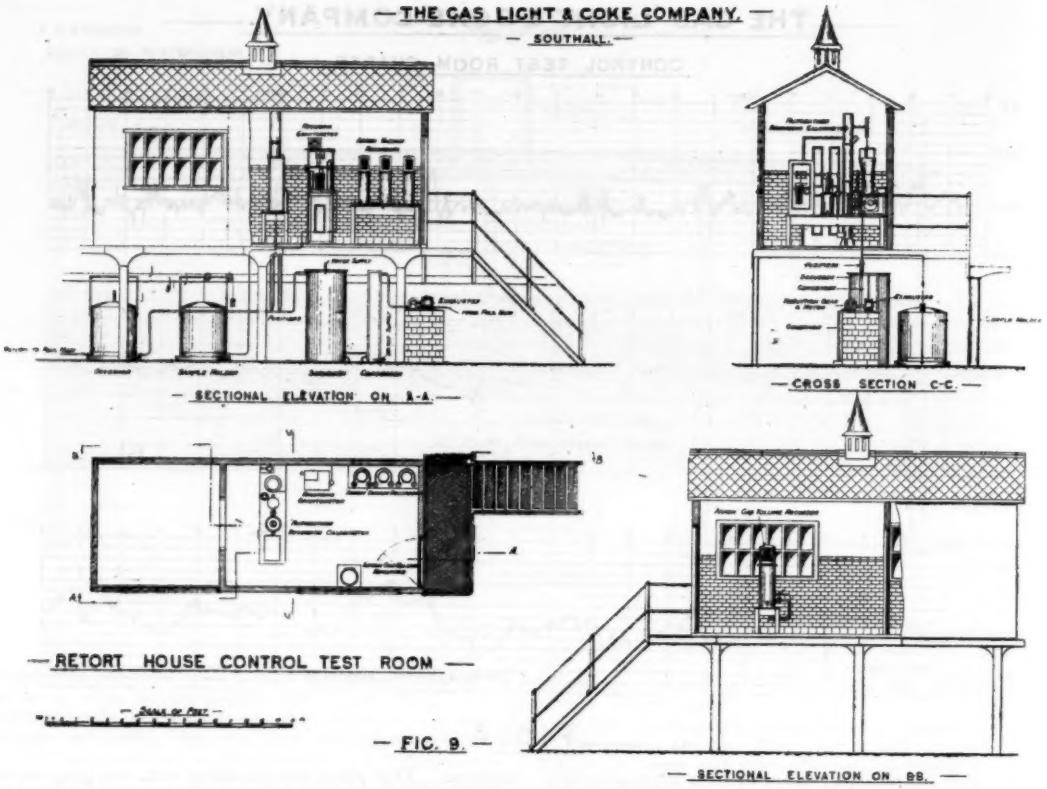
"Arkon" vacuum recorders.
"Arkon" gas volume recorder.
Simmance recording gravitometer.
Fairweather recording calorimeter.

The vacuum recorders are three in number, and register the pull on each of the three sections of the retort house. Adjacent to them on the same bench are the water distant-control valves for loading the governors of each of the three sections.

The gas volume recorder is of the differential type, and is connected to a throttle disc situated in the outlet main of the retort house, and records the make of the house as shown by the drop in pressure across the throttle.

The calorimeter is the latest standard Fairweather pattern incorporating the standard Boys calorimeter, and is supplied with gas by a small exhauster drawing from the outlet main of the retort house which is under 3 in. vacuum. For the effective working of the instrument in conjunction with the other instruments it is essential that lag be reduced to a minimum. This is effected by circulating an amount of gas considerably in excess of the volume required for testing. The excess is relieved into the supply main by means of a governor which regulates a sufficient quantity for the instrument and is situated on the circulating stream as near the apparatus as possible. Condensing, scrubbing, and purification are the chief causes of lag; and it has been found expedient to accomplish the first two operations on the circulating stream. Sulphuretted hydrogen purification is carried out only on the smaller supply to the instruments.

Approximately 300 c.ft. per hour of gas is drawn from the vacuum main by the electrically-driven exhauster. The gas is delivered through a 1½ in. service to a water-cooled condenser of 20 sq. ft. cooling area, and thence to a small tower scrubber of 30 c.ft. volume filled with coke down which water passes. From here the gas passes through a small holder governor back to the foul main. The holder serves several purposes—first, to give the exhauster a steady pressure to work against; secondly, to regulate the amount of gas passing back to the foul main; and thirdly, to provide gas to the instruments for a short period if and when it is found necessary to stop the exhauster. The second function of the holder is accomplished by attaching to the inside of the crown the sleeve which seals the outlet pipe at a predetermined height of the bell. When the


— THE GAS LIGHT & COKE COMPANY. —
— SOUTHALL. —
— SECTIONAL ELEVATION ON A-A —
— CROSS SECTION C-C. —
— RETORT HOUSE CONTROL TEST ROOM —
— SECTIONAL ELEVATION ON BB. —

— FIG. 9. —

holder is full with gas passing through, should the supply lessen or an increased vacuum in the foul main cause an excessive relief from the controlling governor, the bell will lower and, by means of the sleeve, seal the outlet till the balance is restored. Should the exhauster be stopped, the seal will again come into action; and in conjunction with a small seal situated in the base of the scrubber, the holder will supply the instruments for one hour. Between the holder and the scrubber the gas stream is led to the instrument inlets, and from this point the supply to each instrument is taken by the most direct route. In this stream purification is effected by passing through a 3 in. tube, 3 ft. 3 in. long, filled with oxide; a duplicate tube being kept in reserve. At the outlet the stream divides to the calorimeter, gravitometer, and small sampling holder for analysis purposes.

The advantages of the apparatus have been very marked, and may be summarized as follows:

Calorific value is kept very steady, and averages 575 B.Th.U., which is 20 B.Th.U. higher than previous to the installation.

Vacuum.—With the sensitive gauges fitted, and the water control valves adjacent, instant adjustments can be made, and the vacuum kept under rigid control.

Quality of Gas.—Variation in the quality is recorded by the instruments with less than ten minutes lag.

Volume of Gas.—The variation in the make can be observed almost instantaneously.

Copies of the charts showing records of the calorific value, volume, and vacuum, are given in fig. 8, from which you will see how the variations in each can be correlated.

In any system of retort house control it is, of course, essential that the mains connected to the hydraulics should be of ample size, so that the pressure recorded accurately represents the conditions at the various portions of the plant.

Use of Steam on Gas-Works.

Much more attention is now being given to the matter of the production and use of steam on gas-works. In the past a fairly generous production of breeze and small coke for which a low price was obtained provided fuel for steam raising, and if not so used became almost a nuisance. In consequence, for many years little attention was given to the type of furnace used in the boilers or to the economy of the steam-using plants. To-day the position is very different. A large proportion of what was hitherto known as breeze can with suitable treatment be sold at best coke prices—in fact, it is often the case that the demands for small coke are beyond the capacity of the works to produce without resort to coke breaking.

The dust and smalls after the coke has been removed over a ⅜ in. screen are also now in great demand, since their value for use either alone or mixed with small coal has been appreciated by users of mechanical grates. In some Babcock & Wilcox boilers belonging to the Gas Light and Coke Company, which have a capacity per boiler of 25,000 lbs. of steam per hour, steam is being raised with the greatest ease, using only fine coke breeze on chain grate stokers, with an efficiency exceeding 75 p.ct. We have therefore to charge ourselves now with a very much higher priced fuel for steam-raising purposes; and the necessity for carefully surveying the whole question of steam consumption has been forced upon us. Mr. H. C. Smith, of Tottenham, has drawn attention, in a paper he read recently before the Institution of Civil Engineers, to the advantages that might be gained by employing a central electric generating station on a gas-works to supply all power requirements. While we may not be prepared fully to accept his solution of the question, he has in a very piquant manner drawn attention to this important subject. It can hardly be denied that in most works a considerable reduction could be effected in the steam consumption by the replacement of old-type pumps with modern patterns, and by more careful heat insulation of long runs of steam mains.

Recovery of Waste Heat.

The recovery of heat from waste gases leaving the settings has received a good deal of attention during the last year or two; and statements have been made suggesting that some of the reported results indicate a waste of fuel in the producers, on the grounds that the production of steam in pounds per pound of fuel used appears excessive. While one can conceive instances where this may have been the case, with vertical retorts where recuperation is purposely omitted, and with horizontal retorts working at high temperatures and fitted with recuperators of simple and inexpensive design, there are considerable quantities of waste heat available for recovery. In the case of horizontal retort settings an equivalent steam production of 800 lbs., and of vertical retort settings of 1240 lbs., per ton of coal are by no means abnormal. In the latter case the demand for steam to be used in the retorts generally reduces the amount available to 940 lbs. per ton. If the sensible heat of the hot coke discharged from horizontal retorts is recovered, the total steam produced from waste heat from this system of carbonization can be increased to 1200 lbs. of steam per ton.

The consumption of steam for power and other purposes on a gas-works depends upon the type of manufacturing plant installed and upon the quantity of carburetted water gas made; but at works producing gas of which about 30 p.ct. is water gas, the total steam consumption is generally between 1400 and 2000 lbs. per ton of coal. With the full equipment of waste-heat boilers, it would seem possible to provide the whole of the steam required with perhaps some excess at periods other than the day-time working hours. With a view to balancing as far as possible the fluctuating steam demands of the works and the steady output from waste-heat boilers and fuel fired boilers, we are about to instal at our Bromley Works a Ruths steam accumulator having a capacity of 15,000 lbs. of steam between 150 lbs. and 55 lbs. per sq. in. pressure. This accumulator will be 10½ ft. in diameter and 55 ft. in length.

My own experience leads me to think that the advantages of

waste-heat steam are limited to the provision of economies on the gas-works themselves, as there would appear to be no appreciable surplus available for disposal outside the works. An exception might be made if some arrangement were convenient whereby the steam could be sold as made to an adjacent electrical undertaking who would supply the whole of the gas-works power requirements from their own plant. On the other hand, the use of steam derived from waste heat does reduce the quantity of breeze required on the works for steam raising, and it does make available for electricity and other undertakings considerable quantities of excellent boiler fuel.

The cost of generating electricity at Beckton with steam provided from waste heat in a central generating station having an output of 2300 KW. per hour is under 0·4d. per unit, which includes the cost of capital and all other charges.

Lubrication.

It is frequently the same units of plant that cause an excessive consumption of steam which are responsible for large consumptions of lubricating oils. It was in 1920, I believe, that the Gas Light and Coke Company made a thorough investigation of the consumption of lubricants at their various stations. Since that date the oil consumption expressed in terms of gallons per million c.ft. of gas made has shown a steady decrease year by year, until now it is little less than half what it was. The figures, which are rather interesting, are as follows:

Year	Gallons of Lubricating Oil per Million C.Ft.
1920	3·97
1921	2·97
1922	2·57
1923	2·62
1924	2·41
1925	2·36
1926	2·17

Purification and Measurement.

More careful observations are being made of the condensing, washing, and purification systems, whereby improved results are being obtained from existing apparatus; and it is hoped that these investigations may lead to alterations in design effecting savings in the initial cost of the apparatus and in its operation. The process for the removal of sulphuretted hydrogen by solutions of sodium carbonate, which has been developed to a certain extent in America, will have to be capable of more completely removing the last traces of impurity before it can be adopted to meet the stringent conditions enforced in this country. In addition to these modifications, some reduction of working costs will be necessary if the process is to compete successfully with our existing methods.

Many attempts have been made to provide cheaper and less bulky apparatus for the measurement of gas, but it is doubtful whether any of the newer types of meter can compete in reliability and accuracy with the old-fashioned wet station meter. There have been recently installed in this country meters of the Connersville type, the service of which will be watched with interest.

The Waterless Holder.

Gasholder construction has taken a step forward. On the Continent and in America, waterless holders are being erected in large numbers; and it is satisfactory to know that we shall shortly have under our own inspection examples of this type, as the advantages of uniform pressure under all conditions of volume, larger capacity per unit of area, freedom of the gas from contact with water, and cheaper cost per unit of capacity, are very material advantages which are not to be lightly thrown away because of fears based upon a single accident. Very few engineering designs are brought to perfection without experience showing some weakness; and we do not expect the waterless holder to be any exception.

Naphthalene and Moisture Removal.

The removal of naphthalene at the works has eliminated one of the sources of complaint from the consumer, and has to this extent reduced the work of the distribution department. At works where carburetted water gas is manufactured, the use of gas oil as the absorbing medium has made the removal of naphthalene an inexpensive process.

The prevention of complaints from rust and water deposits has still to be seriously undertaken. The installation of a plant by Mr. Harris, of Taunton, about which we are soon to hear full particulars, has indicated the direction by which the removal of the moisture in the gas can be effected with every prospect of success, and, I believe, at a reasonable cost. The present method of testing the calorific value with the gas saturated with water vapour, if retained after artificial drying is adopted, would involve a loss of approximately 1 p.ct. in revenue to the undertaking. The Institution of Gas Engineers have this aspect of the question under consideration; and though it may take some time, I have no doubt it will be possible to suggest some modification to the definitions in the Gas Regulation Act (section 1, 7) which will prove acceptable to the authorities.

The Domestic Coke Boiler.

The introduction of the domestic coke boiler is causing a greatly increased demand for graded coke. For some years the Gas Light and Coke Company have not only carefully graded their coke into four sizes, but have washed the two smaller sizes. It has been possible to recover sufficient of each size by screening only. At the present time the requirements have increased to such an extent that we are having to instal cutters to meet the demand. The advantages of coke boilers for hot water are now thoroughly recognized by householders and builders. New houses being erected in London suburbs are being fitted generally with these boilers for hot water supply, and with gas stoves for cooking. The satisfaction given by the installations has been so great that many householders with older dwellings are having their kitchen ranges replaced by similar installations. A constant supply of hot water at a low cost and with little labour has made the system most popular. The successful employment of graded coke in this connection has stimulated the use of the same fuel in anthracite stoves. I consider that gas undertakings would be well advised to equip themselves immediately with the necessary plant to satisfy properly the inevitable demands of the near future. The washing of coke by reducing the amount of ash improves the coke for these purposes, and customers are generally willing to pay the slightly higher price that is asked to cover the cost of this process. If the shale could be removed from coke by a dry cleaning process instead of a wet one, it would be very advantageous. Trials that have been made of such a process have been most promising, and it would seem that success is probable in the near future.

Prospects of Cheaper Gas.

As a consequence of the sale of larger quantities of coke at enhanced prices, the possibility of selling gas at lower prices very shortly is more than likely; and I am of opinion that the prospects of reduced gas charges were never more hopeful. As I have already shown, the demands for gas are steadily increasing; and a further study of the statistics relating to gas undertakings shows that the increase is at a higher rate during the last few years than during any recent decade.

The average rate of increase during

1884 to 1894 was	3,144	million c.ft.
1894 ,, 1904 ,,	5,042	,, ,,
1904 ,, 1913 ,,	5,655	,, ,,
1913 ,, 1925 ,,	4,940	,, ,,
1923 ,, 1925 ,,	11,000	,, ,,

The last twelve years included the war period, but the great increase in the last three years is worthy of note.

Improvements have been made in all types of apparatus both for the domestic and the industrial use of gas. The advantages of gas for many new purposes are being more generally recognized. The steady progress that has been made in the maintenance of regular quality, ample pressures, the removal of naphthalene and other causes of local interference with supply, and in the provision of well-trained staffs for the maintenance of apparatus are undoubtedly all contributing to the popularity of gas; and if by an improved sale of coke a lower price can be reached, the only difficulty facing gas engineers during the coming years will be the provision of new manufacturing plant at a sufficient rate to keep up with the demands.

Fortunately the leaders of our industry are men of vision, who are wide awake to possibilities, and are not likely to lose any opportunity which can be turned to account in the advancement of the industry. We can therefore look forward with hopefulness and assurance to the future, which in my opinion will emphasize still further the national importance of the gas industry, and further prove the sound technical and financial bases upon which it is founded.

Modern Water Gas Plant.

Mr. C. A. Cunnold, of the Nine Elms Works of the Gas Light and Coke Company, then read a paper entitled "Modern Water Gas Plant." This, and the report of the discussion to which it gave rise, will appear in the next issue of the "Journal."

A hearty vote of thanks was accorded the author for his contribution, on the proposition of the President, seconded by Dr. R. Lessing (London).

Thanks to the President.

Mr. A. E. Broadberry (London) said he was quite sure it would be the wish of the members that they should offer their thanks to the President for the excellent address to which he had treated them that afternoon. They would gain much instruction from a careful study of it.

Mr. J. Urquhart (Dorking) seconded the vote, which was carried with applause, and acknowledged by the President.

REMOVAL AND RECOVERY OF PHENOLS FROM AMMONIA SULPHATE STILL EFFLUENTS.

By D. W. Parkes, B.A., B.Sc.

[Abstract of a Paper read before the Birmingham Section of the Society of Chemical Industry, March 22.]

[The disposal of effluents is a question which concerns the gas industry closely, and will become of still greater urgency in the future. Consequently Mr. Parkes' paper, of which the following is a lengthy extract, is of particular interest. Though the investigation cannot but be regarded as incomplete, the results published indicate the marked possibilities of the use of active carbon for the adsorption of tar acids, and also of thiocyanates]

The average annual production of sulphate of ammonia (25·75 p.ct. NH_3) for the years 1920 to 1925 was, according to the reports of the Chief Alkali Inspector, approximately 300,000 tons. This figure in the later years includes a small amount of synthetic ammonia, but does not include the figures for Scotland, so that 300,000 tons per annum may be considered as a fair average, probably on the low side. Assuming the strength of the crude liquor from which this sulphate was made to be 8 oz., or, in more scientific terms, 1·73 p.ct. of ammonia, 300,000 tons of ammonium sulphate are equivalent to nearly 1000 million gallons of crude liquor. Allowing 50 p.ct. increase in volume, which normally occurs during distillation of the liquor, we arrive at a figure of 1500 million gallons of waste ammonia liquor to be disposed of annually.

The tar acid content of waste ammonia liquor varies considerably, being sometimes less than 0·1 p.ct. and frequently greater than 0·5 p.ct.; but at 0·2 p.ct. the tar acid content of 1500 million gallons would be 3 million gallons. These figures should suffice to indicate the magnitude of the problem which confronts those responsible for the cleanliness of our rivers and streams, and they also disclose enormous wastage of a material which has many uses in modern industry. There are therefore really two problems—the first the removal of the tar acids from the liquor, and the second the recovery of the tar acids removed. The problem of the removal of the tar acids appeals chiefly to those responsible for the cleanliness of rivers and streams, and for the proper working of sewage disposal plants, while recovery of the tar acids appeals more to the ammonia distillers, who in due course will probably be compelled by law to carry out some form of purification, and who hope, by recovering the phenols removed, to defray at least part of the cost of purification.

The process for the extraction and recovery of tar acids with which we are mainly concerned in this paper relies on the fact that certain types of activated carbon will rapidly remove phenols from dilute aqueous solutions. The method is briefly as follows: The waste liquor is first saturated with carbon dioxide, whereby a considerable amount of sludge is precipitated, which is allowed to settle out. The colour of the liquor changes from a deep brownish red to a pale yellow, but the tar acid content remains practically unaltered. A considerable amount of sulphuretted hydrogen is, however, often evolved. The settled liquor is then brought into contact with the activated carbon, whereby the whole, or any desired proportion, of the phenols is removed. At the same time there is a considerable reduction in the thiocyanate content and a big drop in the oxygen absorption figure. When the carbon is saturated with phenols, it is freed as far as possible from adhering liquor, and is distilled in a current of superheated steam, whereby 80 p.ct. of the tar acids adsorbed can be recovered, chiefly in the form of liquid tar acids and a saturated aqueous solution. The carbon is then ready for the treatment of a further quantity of liquor.

I will now deal briefly with the various parts of the investigation which led to our present method of procedure. The subject is still under investigation both in the laboratory and on a semi-works scale. The results and method of procedure must not therefore be considered as final or the best that can be obtained.

The earlier experiments were all carried out on the batch principle, as follows: A litre of the waste liquor, containing 0·36 p.ct. of phenols, was saturated with carbon dioxide, and the precipitate which separated was removed either by filtration or settling. The clear liquor was then agitated for one hour with 80 grammes of carbon, about 6-8 mesh. The carbon was removed from the liquor and drained as far as possible, and distilled in a flask, in a current of carbon dioxide gas. The distillate, consisting of liquid tar acids and an aqueous solution of tar acids, was examined for its tar acid content. The carbon was cooled and applied to further batches of liquor in the same manner. Table I. gives the results of this series of experiments, and Table II. a summary.

The first column in Table I. represents the number of the experiment and also the "age" of the carbon. It will be seen that the carbon was used thirty times in the treatment of thirty separate litres of liquor. In column 2 are given the percentages of tar acids adsorbed from each litre of liquor. The figures in column 3 are the percentages of tar acids recovered calculated on the total tar acids in each lot of liquor; and in the last column are given the percentages recovered calculated on the tar acids adsorbed in each experiment.

Table I.—*Adsorption and Recovery of Tar Acids. CO_2 Flask Distillations.*

Expt. No.	P.Ct. Adsorbed.	P.Ct. Recovered on Total.	P.Ct. Recovered on Adsorbed.	Expt. No.	P.Ct. Adsorbed.	P.Ct. Recovered on Total.	P.Ct. Recovered on Adsorbed.
1	100	28·9	28·9	16	92·5	60·0	64·9
2	99·2	46·7	47·1	17	91 6	57·8	63·2
3	100	46·9	46·9	18	89·8	57·8	64·5
4	99·2	53·4	53·8	19	89·8	54·7	60·9
5	99·2	51·1	51·5	20	87·2	58·4	67·1
6	100	61·1	61·1	21	84·2	54·7	65·0
7	100	62·2	62 2	22	77·6	54·2	69·8
8	98·6	65·5	66·6	23	75·0	47·1	63·1
9	99·2	67·8	68 3	24	76·3	45·0	58·9
10	98·7	65 6	66·5	25	69·4	45·8	65·9
11	97·7	63·3	64·8	26	57·9	35·8	61·8
12	96·7	96·7	72·1	27	52·6	35·8	68·0
13	95·6	63·3	66·3	28	59·0	36·8	73·1
14	95·3	71·1	74·6	29	42·2	35·8	85 0
15	93·3	56·9	61·0	30	44·8	34·0	77·7

Table II.—*Adsorption and Recovery of Tar Acids. CO_2 Flask Distillations.*

Summary of Table I.

Concentration of tar acids in liquor	0·37 p.ct.
Carbon used	80 grammes
Times used (number of experiments)	30
Liquor treated	30 litres
Tar acids in liquor treated	111 grammes
Tar acids removed from liquor	94·1 ,,
Tar acids removed from carbon	58·6 ,,
P.ct. of total tar acids removed	84·7
P.ct. of total tar acids recovered	52·7
P.ct. of adsorbed tar acids recovered	62·2

We found that temperatures up to 60° C. during the adsorption had no appreciable effect on the amount of tar acids adsorbed. Exposure of the carbon to air, either before or after adsorption, decreased the amount of tar acids recovered; and consequently in many of the experiments carried out before the use of superheated steam, the carbon was cooled and preserved in an atmosphere of carbon dioxide. Part of the decomposition of the tar acids in the carbon was found to be due to the use of carbon dioxide; and we tried nitrogen and vacuum distillations without much improvement. Distillation with superheated steam is an obvious solution of the difficulty; but until we had investigated the matter for some time, we were troubled with the drawback of recovering our tar acids in a very dilute form. In some cases our recovered solution of tar acids was of greater volume than the original liquor treated. However, the greatly increased percentage of tar acids recovered by means of superheated steam encouraged us to persevere; and in the end we managed to overcome the difficulty of increased dilution consequent on the use of steam.

It will be understood that, besides tar acids, the carbon takes up a considerable amount of water which cannot be removed mechanically; and this water distils over with the tar acids. By decreasing from 80 to 50 grammes the amount of carbon used for treating a litre of liquor, we found that we could still remove practically 100 p.ct. of the tar acids in the liquor, and thus obtain in our carbon a higher ratio of tar acids to water. By using steam superheated to 250 to 300° C. and starting with a furnace temperature of 370 to 380° C., rising to 600° C., the amount of steam required was reduced to a minimum; and the improved recovery of tar acids resulting on the use of steam, together with the greater amount of tar acids in the carbon, about balance the dilution.

The next series of experiments was carried out as before, with the exception that 50 grammes of carbon were used, and 1000 c.c. of liquor containing 0·421 p.ct. of tar acids were treated in each batch test. The carbon, contained in a silica tube heated by an electric furnace, was distilled in a current of superheated steam. Under these particular conditions it was found that the bulk of the tar acids passed over fairly rapidly between 450° and 520° C. and that above this temperature the distillate contained only a small concentration of tar acids. The receiver was therefore changed at the higher temperature, and the distillate collected in two fractions, A and B. Fraction

A contained about 3 p.ct. of tar acids, partly in the liquid form, and fraction B only about 0·1 p.ct. The distillation was always continued after fraction A had been collected, in order to clean out the carbon. Under working conditions, fraction B would be returned to the plant for further treatment.

The results of this series are given in tabular form in Table III.

TABLE III.—*Distillation of Carbon with Superheated Steam in Furnace.*

No.	P.Ct. Adsorbed.	Recovery. Distillate "A."			Total Recovery.	
		P.Ct. on Adsorbed.	P.Ct. on Total.	P.Ct. in Distillate.	P.Ct. on Adsorbed.	P.Ct. on Total.
1	100	66·8	66·8	2·01	70·7	70·7
2	100	74·5	74·5	2·62	79·3	79·3
3	98·9	77·8	76·8	2·93	83·0	81·8
4	98·6	80·1	78·8	2·77	85·4	84·0
5	98·3	78·3	76·8	2·82	83·6	82·0
6	98·0	78·5	76·8	2·95	82·8	81·2
7	97·7	79·7	77·8	2·99	83·8	82·0
8	97·7	73·4	71·4	3·01	76·8	75·0
9	97·5	78·3	76·2	2·69	83·1	81·1
10	97·2	77·5	75·2	2·75	81·2	78·9
11	97·0	75·6	73·3	3·09	82·0	79·5
12	97·0	76·5	74·1	2·60	80·5	78·2
13	95·4	75·2	71·5	2·52	80·5	76·6
14	95·2	75·1	71·5	3·34	79·5	75·6
15	94·6	74·9	70·7	2·98	81·5	77·0
16	94·2	73·0	68·8	2·90	80·5	76·0
17	93·4	74·8	69·8	2·68	80·3	75·0
18	92·6	75·4	69·8	2·68	81·1	75·0

The results of this series of experiments show that the use of superheated steam improves the recovery from about 60 to 80 p.ct. Of this 80 p.ct., 75 p.ct. is in the form of a 3 p.ct solution, and the remaining 5 p.ct. in the form of a very dilute solution which would be returned to the plant.

Semi-Continuous Experiments.

The next step was to turn the process into a continuous one. Apart from the obvious advantages of a continuous process, there is one that especially applies in the present instance. If liquor containing tar acids is run through a series of vessels containing carbon, it will be possible to arrange matters in such a way that the carbon in the first vessel will become saturated with tar acids, while the effluent from the last vessel will be free from tar acids. In this way the carbon in the first tube will contain the maximum possible amount of tar acids, and on distillation the concentration of tar acids in the distillate will be increased. Incidentally we found that the greater the amount of tar acids in the carbon, the better the percentage recovery.

The first series of experiments carried out on these lines was conducted in an apparatus consisting of two vertical silica tubes about 30 in. long and 1 in. internal diameter. The top of the first tube was connected to the bottom of the second. Each tube contained 75 grammes of carbon; and liquor containing 0·412 p.ct. of tar acids was run through at the rate of about 30 c.c. a minute. When tar acids could be detected in the effluent from the second tube, the flow of liquor was stopped, and the first tube was drained, and distilled in the electric furnace. When cool, the tube was connected up in position 2, and the flow of liquor continued until tar acids were again detected in the effluent, when the other tube was distilled. This process, which was thus only semi-continuous, was carried on until 60 litres of liquor had been treated.

The figures for this series are given in Table IV., and a summary of the results is given in Table V.

TABLE IV.—*Continuous Extraction and Recovery of Tar Acids with Activated Carbon.*

No.	Adsorbed. Grms.	Liquor Treated. C.C.	Rate. Gallons per Hour.	Recovery.				
				Tar Acids.	Solution A. Grms.	Solution B. Grms.	Total.	Average. P.Ct.
A	41·21	9930	0·32	11·5	17·16	6·07	34·73	84·5
2	35·43	8620	0·42	7·3	10·07	1·08	18·45	69·4
3	17·11	4250	0·38	6·8	10·07	1·09	17·96	76·0
4	14·78	3670	0·54	6·1	7·32	0·05	13·47	78·2
5	15·11	3680	0·35	5·2	8·42	1·15	14·77	80·6
6	20·53	4970	0·47	5·65	7·96	1·02	14·63	79·1
7	20·14	4885	0·43	8·4	7·37	0·32	16·09	79·1
8	14·98	3720	0·41	6·9	5·83	0·62	13·35	80·0
9	17·70	4340	0·42	6·78	7·23	0·23	14·24	80·2
10	15·77	3900	0·41	5·2	7·41	0·08	12·68	79·8
11	12·41	3110	0·43	3·4	7·23	0·82	11·45	80·7
12	12·86	3170	0·42	3·5	6·31	0·23	10·04	80·7
13	11·24	2740	0·4	3·3	6·13	0·3	9·73	80·8
13A	..	..	..	..	2·14	0·34	2·48	81·8

TABLE V.—*Summary of Semi-Continuous Experiments.*

Carbon used			150 grammes
Concentration of tar acids in liquor			0·412 p.ct.
Volume of liquor treated			60·985 litres
Tar acids adsorbed from liquor			249·3 grammes
Tar acids recovered from liquor			204·1 ,, (81·8 p.ct.)
The tar acids were recovered as follows:			
Liquid tar acids (wet)	80·0 grammes		39·2 p.ct.
As a 3·7 p.ct. aqueous solution	110·7 ,,		54·3 ,,
,, 0·4 ,, ,, ,,	13·4 ,,		6·5 ,,
	204·1 ,,		100·0 ,,

The 13·4 grammes recovered in the form of a 0·4 solution would have to be returned to the plant for further treatment. It would amount to about 5·5 p.ct. by volume on the total liquor treated.

Though it is somewhat dangerous to draw inferences from such small-scale experiments, it is interesting to note that, if we can get the same results on a large scale, with a ton of carbon we could treat the liquor at the rate of about 2700 gallons per hour. Further, assuming the plant to consist of only two vessels, each containing half-a-ton of carbon, we should have to distil one of the vessels about every two hours. In actual practice, one would presumably use more carbon divided into a number of vessels, and thus continue longer without the necessity for distilling.

Continuous Experiments.

Owing to the fact that further supplies of the carbon we had been using were not available, the experiments in the continuous apparatus were carried out with carbons which from our point of view were far below the standard of the carbon used in the semi-continuous experiments. The results of these continuous experiments are therefore poor compared with those of the semi-continuous experiments; but they give new information with regard to the effect of our process on thiocyanates and oxygen absorption.

The apparatus was simple, consisting of four tubes and supply vessels. The tubes were 30 in. long by about $1\frac{3}{4}$ in. in diameter. They were connected in series, the top of one to the bottom of the next. A common inlet pipe at the bottom supplied the liquor, and a similar pipe at the top allowed the liquor to run off. The taps and connections were so arranged that the liquor could be run through any three tubes in series, while the fourth tube was out of action; the idea being that while liquor was being treated with the carbon in three tubes, the carbon in the fourth tube would be in the process of distillation, and ready to put into action again when another tube was required.

The liquor was saturated with carbon dioxide in the carboys in which it was received, and was then allowed to settle for a few hours in order that the sludge might subside. The clear liquor was then pumped up into the supply vessel by hand as required.

In the first two or three runs, wood charcoal was used. This on a half-hour test had a high activity; and it was calculated from the semi-continuous experiments that, with three tubes in use and 150 grammes of carbon in each tube, it should be possible to run the liquor at a speed of about 100 c.c. a minute. With new carbon in the three tubes, it should have been possible to run about 29 litres before it became necessary to change a tube. Thereafter a change of tube would become necessary after every 12 litres.

The run was therefore started on these lines, and from the results given in Table VI. it will be seen that our expectations were not realized. By the time the eighth litre had passed, the effluent contained over 0·01 p.ct. of tar acids; thiocyanic acid was back at the original figure; and the oxygen absorption was rising fairly rapidly. No. 1 tube was therefore cut out, and No. 4 tube was put in at the end of the train. There was a slight temporary improvement in the effluent, but it was clear that the results were far below those calculated; and it was decided to start a fresh run at about half the speed.

TABLE VI.—*Run No. 1 Continuous Apparatus.*

Effluent Collected in One Litre Samples.

No.	Time of Flow, Minutes.	Phenols, P.Ct.	Thiocyanic Acid, P.Ct.	Oxygen Adsorbed, $\frac{1}{10000}$
Original liquor		0·42	0·141	882
1	8	0·0096	0·028	120
2	$10\frac{3}{4}$	0·0067	0·05	153
3	$11\frac{1}{2}$	0·0082	0·076	174
4	6	0·0075	0·097	205
5	$7\frac{1}{2}$	0·007	0·123	222
6	$9\frac{1}{2}$	0·0082	0·134	296
7	10	0·0082	0·139	240
8	9	0·012	0·141	315
9	$6\frac{1}{2}$	0·0096	0·093	216
10	$8\frac{1}{2}$	0·0096	0·116	240
11	10	0·011	0·131	266
Mean	8 7	0·0087	0·10	222
P.ct. removed	..	99·8	29·0	75·0

TABLE VII.—*Run III. Continuous Apparatus.*

EFFLUENT COLLECTED IN ONE LITRE SAMPLES.

Sample No.	Time of Flow. Minutes.	Phenols. P.Ct.	Thiocyanic Acid. P.Ct.	Oxygen Adsorbed. $\frac{1}{100000}$	Sample No.	Time of Flow. Minutes.	Phenols. P.Ct.	Thiocyanic Acid. P.Ct.	Oxygen Adsorbed. $\frac{1}{100000}$
Original Liquor		0·43	0·142	873	22	19½	0·0055	0·142	224
1	18½	0·011	..	..	23	19½	0·0057	0·144	232
2	16½	0·087	..	..					
3	18½	0·007	..	..	24	20½	0·0035	0·079	193
4	16½	0·009	..	..	25	20½	0·0035	0·079	193
5	15	0·009	..	..	26	21	0·0035	0·139	257
6	12	0·009	..	..	27	21	0·0035	0·139	257
7	12	0·009	..	..	28	19½	0·0045	0·141	281
8	18	0·—	..	..	29	19½	0·0045	0·141	281
					30	19½	0·0297	0·141	327
9	11	0·007	..	..	31	19½	0·0297	0·141	327
10	16½	0·007	..	..	32	22	0·0617	0·141	403
11	20	0·007	..	..					
12	18½	0·007	..	..	33	21½	0·0045	0·141	191
13	18¾	0·007	..	..	34	21½	0·0045	0·103	191
14	18¾	0·007	..	..	35	21	0·0045	0·135	253
15	20½	0·007	..	..	36	20½	0·0097	0·141	320
					37	20½	0·0097	0·141	320
16	20	0·004	0·087	216					
17	19	0·0057	0·135	250	38	19	0·0035	0·09	188
18	16	0·0057	0·135	250	39	19	0·0035	0·09	188
19	22	0·0062	0·143	252	40	21	0·012	0·135	337
20	18	0·0039	0·113	203	41	21½	0·0045	0·125	191
21	17½	0·0039	0·113	203	42	21½	0·0045	0·125	191
New Carboy	(after 19th litre)	0·412	0·135	748					

Average phenol content of effluent . 0·011 p.ct.
Total phenols in liquor treated . . 176·45 grammes
" " recovered . . . . . 110·1 "
Percentage total phenols recovered . 62·5

Percentage adsorbed phenols recovered . . . . 64·1
Tubes changed after 8th, 15th, 19th, 23rd, 32nd, 37th, and 40th litres.

The carbon was therefore distilled, and yielded 74·5 p.ct of the tar acids adsorbed. Of the tar acids, 37 p.ct. was recovered as liquid tar acids, 40 p.ct. in the form of a 5 p.ct aqueous solution, and the remainder as a dilute (about 0·5 p.ct.) aqueous solution which would be returned to the apparatus.

Run 3 was carried out with the same carbon as was used in Run 1. The carbon was, of course, freed from tar acids before commencing the new run. The results are give in Table VII.

Although the liquor was only run at about 50 c.c. a minute, the improvement is not very great. It is probable that each tube could have been run a little longer than was actually done, before the tar acids in the effluent reached 0·01 p.ct.; but even so the extra liquor would not have amounted to more than a litre or two per tube.

If will be noted that the thiocyanate in the effluent rises to about its original value long before the tar acids. At the outset we were mainly concerned with the removal of the tar acids; and the reduction in thiocyanates is merely incidental. We intend, however, to investigate this point further; and it does not seem unreasonable to suppose that it will be possible to add another adsorbent for the thiocyanates or to select a carbon which will have a greater effect on this impurity.

Run 4 was carried out with a carbon made from coke. The activity of the carbon was not particularly high, and the results, which were very similar to those already given, are of no particular interest in themselves. The run is simply of interest in showing that results can be obtained with a material such as coke suitably treated. The coke was not specially selected, but was of the low-temperature variety and was activated in the laboratory. Its apparent density was high compared with the wood carbon, and the 150 grammes placed in each tube only filled about two-thirds of the tube.

[Since the completion of this paper, a short run on the continuous apparatus with an entirely new sample of carbon has confirmed the results obtained in the semi-continuous apparatus with regard to both the rate of flow of liquor and the amount of liquor that can be treated per unit weight of carbon.]

Discussion.

The CHAIRMAN (Mr. J. C. Mann) suggested that the chief points the author had to consider were the decomposition of phenols in the early stages where he used carbon for the first time, and the attainment of a suitable carbon.

Dr. A. PARKER said the gas industry viewed the subject with such concern that it had in operation at the present time a Gas Effluents Research Committee, working on the treatment and disposal of sulphate plant effluents. The programme before them was extensive, and the paper had touched on one possible way of dealing with gas-works effluents. There were many other methods. A number of patents had been brought out, mainly on the Continent, in connection with the removal of phenols from waste liquors; and in several activated carbon was mentioned. He gathered that the author had operated mainly with the effluent spent liquor from vertical retorts. Of course, one got lower figures with horizontal retort liquor. The first item of importance was that of costs. Was the process likely to be profitable, assuming there was a supply of really good active carbon? He knew from researches at Leeds University during the last few years that the difficulty of obtaining carbon was by no means a new one. He wondered whether Mr. Parkes could elaborate the point with regard to the decomposition of phenols in the early stages, because the same thing occurred with benzole.

Dr. E. W. SMITH congratulated Mr. Parkes upon a really valuable contribution on the subject. To the author, the gas industry must give its thanks; and more particularly to the progressive policy of Messrs. Robinson Brothers for allowing him to publish material which many might consider premature to make known. Effluent was a necessary evil in gas-works practice, and there would come a time when its treatment would be compulsory. Therefore, too much could be made of the question of cost. It was not necessary to show a profit. A further point which arose was whether the charge for dealing with the effluent was one that should be borne by the industry itself. Gas undertakings were large ratepayers; and for the rates paid they had a right to claim consideration for the disposal methods that were adopted for effluents. Another point which gas undertakings must consider was that effluent difficulties could be largely reduced by not making as big a proportion of the oxygen-absorbing bodies in liquor.

Mr. F. R. O'SHAUGHNESSY (Birmingham, Tame, and Rea District Drainage Board) said that the increased cost of treating sewage containing over 1 p.ct. of waste liquor was great.

Mr. ROWELL pointed out that activated carbon was costly, and the products were not too valuable.

Mr. PARKES, replying on the discussion, said he could not give any figures as to costs. They knew beforehand that phenols were being removed from the liquor at a loss. Therefore they worked on a different process, which seemed fairly hopeful. He could not give any information about the decomposition of phenols, though there was no doubt they did decompose.

A vote of thanks to Mr. Parkes terminated the meeting.

The "Scholes" Bomb Calorimeter.

In the "Scholes" bomb calorimeter, which is manufactured by Messrs. G. Cussons, Ltd., of Manchester, particular attention has been paid to the method of sealing the bomb against leakage of the contained oxygen or gases, and to the charging and discharging of the bomb, to the crucible support, and to the ignition arrangements. The bomb body, cover, and most of the details are made of stainless steel, and are machined from the solid billet. The bomb is inverted so that the cover forms the base on which it stands, and the ignition rods (one of which acts as a support for the crucible cradle) are attached to the base. The upper portion of the bomb is thus in one piece, the head of which carries the charging and discharging valves, and the complete bomb consists of two parts only—*i.e.*, the body and the base. This design ensures a rapid heat transmission through the head and upper walls of the body, unimpeded by external attachments such as heavy clamping nuts, and enables the stirrers to fit closely to the body of the bomb, thus causing an effective circulation of the water over the surface.

"B.C.G.A." DISTRICT CONFERENCE AT WALLASEY.

CHESHIRE, NORTH WALES, AND LANCASHIRE AREA.

A District Conference of the British Commercial Gas Association was held on Friday, April 1, at the Wallasey Town Hall, and was presided over by Alderman A. H. Evans, the Chairman of the Wallasey Gas and Water Committee. An official welcome was given to the members by the Mayor (Alderman J. Urmson), who was for many years a member of the Gas and Water Committee.

The Mayor said that in Wallasey they were proud of their borough, which owned, among other undertakings, the gas-works. He hoped their deliberations would be helpful in every way.

CHAIRMAN'S OPENING REMARKS.

The Mayor has given us all an official welcome; and we are grateful to him for his words and for his presence. As Chairman of the Gas and Water Committee, I also venture to welcome you cordially, and trust that our deliberations may be pleasant and profitable. Apart from our essential business as a gas conference, we rejoice to see you as visitors to Wallasey, and hope you will find time to see something of our trading undertakings, and also something of the natural beauty of our parks, promenades, and sea front, of which we are very proud.

In this address, I hope to be able to contribute something which will be of service to you, our visitors, as practical engineers and gas managers, and which will help the general public to take a true view of the gas industry as it stands to-day.

The Wallasey Undertaking.

The returns of our gas undertaking for the year ended March 31 have just been presented to us; the figures being actual to the end of January, and estimated for February and March. I may say that we estimated for a loss at the end of the previous year—to March 31, 1926—but instead, we were able to place £5000 to the credit of a working capital account, and £3530 to meter account, and to bring forward £2941. When we came to the figures for 1926-27, the Gas Committee had to spend £60,284 extra for foreign coal; but, from residuals, coke, tar, &c., we derived an increased revenue of £28,575. The prices of gas were raised during the year, and an amended estimate still gave expectation of a deficit of £9025; but this was all wiped out, and we finished the year with a surplus of £1359, which, I think you will agree, was a highly creditable performance.

With regard to our estimates for 1927-28, we have, of course, included in the price of coal the increased cost of railway carriage, which came into operation on Feb. 1; we have also taken a very conservative view of the prices we shall obtain for coke, tar, and sulphate of ammonia, and have only estimated on a reduced sale of gas. After doing all this, we have calculated our income on the reduced prices for gas which are to come into operation at the beginning of April. Even then we are left with a surplus of £22,590. This will serve to show the Conference in what a solid position our undertaking is; and as we have sold some thousands of new apparatus during the last few months, there is reason to believe that our figures will turn out even better.

Sales of Apparatus during the Coal Strike.

As for the period of the coal stoppage, we sold close upon 2000 cookers, fires, water heaters, &c., during three months, and the difficulty was to supply them fast enough. The stoppage was in some respects helpful to the gas industry as a whole, because, as a result of the inconvenience the public were put to, companies and corporation departments throughout the country report a big increase in the sale of fires, cookers, and other appliances. In London, the number of appliances let on hire by a single company is increasing at the rate of 80,000 a year, and a branch office in one of the most popular suburbs is issuing gas fires at the rate of 200 a week. Gas cookers on hire in Manchester total 24,651, an increase of 1649 during the year; and gas fires, at 7295, show an increase of 1149. Cooking and heating appliances in use in Glasgow number 394,371; and during the last twelve months 7775 orders have been given, making an increase of 2417 over the figures of the previous twelve months. Birmingham Gas Department has completed a record year, having sold 13,400 million c.ft. of gas. For the first time, the number of fires in use in that city has passed the 100,000 mark, while nearly twice as many cookers and water heaters are now installed. A large demand for cooking and heating appliances is reported from Nottingham, where the Corporation have installed over 3000 fires and cookers under a hire-purchase system—at present the undertaking has about 50,000 cookers out on hire. Many Corporations have been compelled to apply to the Ministry of Health for powers to negotiate substantial loans for the purchase of appliances.

The net result of the coal stoppage was that the demand for gas appliances was greatly increased, with consequent larger gas outputs. The gas industry has now a splendid opportunity; and if the selling side are prepared to take advantage of it by giving more to maintenance, the coal stoppage will prove to have been a great advantage, notwithstanding all the difficulties we had to put up with. Many people have, through sheer necessity, learnt during this period the advantages of gas for cooking and heating, and they also learnt the value of coke for domestic as well as industrial purposes, when they could not obtain the coal to which they were accustomed.

Maintenance.

I attended the Maintenance Conference which was recently held in London, when a resolution was unanimously passed to the effect that all gas undertakings should adopt a policy of maintaining all appliances and apparatus, if they are to retain their business. From the papers that were read, and the discussion that ensued in London, it was clearly demonstrated that there is an essential difference between inspection and maintenance. The Gas Light and Coke Company, for instance, have fitters called maintenance men, who, while capable of giving advice and assistance to the consumer up to a point, are not considered to have the experience and efficiency of the type of man they employ to carry out skilled examination and the recording of existing appliances with an eye to future business. The men chosen as "Examiners" are what the Company call Assisting Inspectors. These men have been through all the phases of gas sales work, and have had great experience in handling inquiries, taking orders, and getting out specifications and estimates for fixing all appliances. The result of this has been enormous additional business.

While the smaller undertakings cannot hope to do all that this great Company has achieved, they can increase their business tremendously if a proper census and a maintenance scheme are adopted. In Wallasey we have had a general census and record of appliances, and our men in going round have secured extra business, and have been able to help and advise our 22,000 customers.

After a brief reference to unaccounted-for gas, and a remark to the effect that the electricity industry has similar trouble, Alderman Evans concluded by saying that the gas industry has been troubled somewhat by the boost that the Electricity Supply Act has given to the sister service, but it seems to be universally thought that the effect will be to stir up the gas industry to increased achievement. We can go on with our work feeling that we have a great future before us if we keep up to date with our organization and administration.

NATIONAL PUBLICITY; WORK AND POLICY.

By W. M. Mason, Manager of the "B.C.G.A."

Mr. Mason said these District Conferences were really platforms for chairmen of gas committees and companies, as well as engineers and administrators. They came together to discuss, not technical questions alone, but more particularly the selling side of the industry. It was also the idea of the Executive Committee that the members should have opportunities to discuss, and, if necessary, to criticize, the policy of the Association. Most of them knew what the Association stood for, its guiding principle, the real idea behind it. But men were growing up and taking technical positions who might not have been educated upon those points; and they ought to be put into a position to reply, not apologetically, but with sincere conviction, of the value of the Association and its work, when asked: "What is the good of it?" "How does it benefit us?" "Do we get value for the money which is expended?" The work was of vital interest to every member of the gas industry. Indeed, the gas industry constituted the Association. The "B.C.G.A." was not a separate organization outside the gas industry and controlled by a handful of officials, or others; it was the gas industry itself constituted for salesmanship, for the purpose of getting into a central pool money which could be got in no other way, and doing with that money more effective work than could be done by any individual undertaking, no matter how large. All the undertakings, large and small alike, were on the same basis in respect of their contributions to the central pool. The largest paid £10,000 a year. This seemed a big sum to give for national work, but it came back to the undertaking in the form of increased demand. By joining in the building-up of a fund of £30,000 or £40,000, they worked much more effectively for themselves than if they separated from the others and advertised on their own account.

In considering this problem, the first questions were: "Is publicity profitable? Is publicity necessary? Does the money expended come back, or is it in effect thrown into the sea?" It was well known what the largest business people in this country thought of advertising. People who lived on the banks of the Mersey need hardly be reminded of the examples of Lord

Leverhulme, one of the greatest business men this country had produced, and of the Companies he was connected with. Money was poured out in the advertising of "Sunlight Soap." Why was that done? Because it paid to do it. The big business people advertised because it paid them to advertise. That was the plain English of it. A councillor once said to him: "You are asking us to tell the people in this district about gas. Do you know that we have celebrated our centenary? Surely when gas has been supplied for a hundred years, they must know all about it." Everybody did not know about gas. Even the gas managers did not know everything about it. Some had not seen that great installation at Smethwick, where 160 million c.ft. per annum were used for making castings. There were 3000 trades in which gas was used. No one present had seen them all. Even in a place like Wallasey, with an up-to-date engineer like Mr. Crowther, and an up-to-date Chairman like Alderman Evans, backed by a Committee who were keen to do the right thing, there were people ignorant of the uses of gas for domestic purposes. There was need for education in this matter; and the "B.C.G.A." stood for that education.

In the truest sense, the "B.C.G.A." was the gas industry, because it united or associated together, for purposes of propaganda, publicity, and sales development, undertakings which represented over 92 p.ct. of the gas sold in the United Kingdom. The fact that some undertakings were content to profit by the work which was paid for by their neighbours did not affect this position. The Association preached, in the industry and out of it, the gospel of good service in the broadest and wisest sense. It was not an organization separate and distinct from the industry, into which large sums were annually dropped and lost; it was the channel, the clearing house, by means of which individual contributions were made more effective, and ample return was given in the form of advertisement and service. Much of this was behind the scenes, and could not be made public; but the keenest minds in the industry acknowledged that it had been essentially beneficial in the face of growing competition.

That competition came mainly from electricity. Really, competition was the finest stimulus that a live business man could have. One who had the right stuff in him would willingly fight for what he wanted. He had this message to give to the younger men in the gas industry. "Do not worry about your competitors. Without them, life would be flat and stale, with no contest, and therefore no prizes and no sporting spirit. If you do not do well, don't put the blame on competitors; blame yourselves. More money is being lost by neglect, by waste, by jogging along in a rut, by lack of team spirit, than is lost by competition. If competitors get ahead, be a good loser; and instead of making excuses, play the game harder, with all the brains you have and all the other brains that can be hired. Determine to win, and show competitors that you are still in the running."

If anyone thought the particular district he was concerned with was not touched by the Association's advertisements, he should apply a simple test. Let him go to the local bookstall, and ascertain how many of the publications in which the Association advertised were taken at that stall. It would be found that many of those publications circulated in the district. So, in return for the subscription to the Association, the local gas undertaking got the benefit of advertisements read locally upon a scale much greater than individual efforts could achieve. Compare this expenditure with the money which an up-to-date firm was prepared to spend to secure publicity. If the late Lord Leverhulme had been able to buy up the gas industry, lock, stock, and barrel, what sums he would have spent in boosting it!

THE EFFICIENT MODERN GAS APPLIANCE.

By Dr. Harold Hartley, of Radiation Ltd.

The title chosen for my remarks implies that the modern gas appliance is an efficient article, well-made, and soundly designed. I propose to justify this claim by brief reference to two well-known examples—namely, the gas fire and the gas cooker.

Though the gas industry touches on the lives of all of us at so many points, often it is not realized what a debt we owe to it. Novelty appeals to the man in the street; and when something new is put before him, he is apt to forget the service he is receiving from an old friend. When a new industry is started, many mistakes are made; and some of the early types of gas appliances, with their defects, were in existence within the lifetime of all of us. Happily, the gas appliance industry has passed out of that stage of development. It is, however, a phase through which all new industries have to go.

Gas Fires.

The modern gas fire, which is so different from its progenitors, is silent in operation, heats by radiant energy, ventilates the room, and is hygienic, satisfying all the requirements which medical research has shown to be necessary for proper domestic heating. It possesses all the good points of the coal fire, without its defects. Pollution of the atmosphere is eliminated when gas is used in the home for heating. As compared with the electric heater, it possesses three distinct advantages:

(1) It ventilates the apartment.
(2) It is odourless (with the electrical heater there is often present the peculiar odour characteristic of charring dust).
(3) It is economical to operate.

It must be borne in mind that one Board of Trade unit produces 3412 B.Th.U., and is equivalent to 1/29th of a therm. With gas at 8d. per therm and electricity at 1d. per unit, heating with the electric fire costs more than twice as much as with the gas fire.

For intermittent service the modern gas fire is cheaper also than the coal fire. Even for periods up to 4 hours consecutively, it costs no more to heat a room by means of gas than it does with coal. When the heating of the room is required continuously for longer periods, it is cheaper to use coal. In arriving at these conclusions no allowance is made for the labour involved in the handling of the solid fuel, removing ashes, &c., or for the effect of the dust and smoke from the coal fire on the interior decoration of a room. While these factors do play an important part in our domestic life, it is difficult to compute their value on a cash basis. Nevertheless, they do exist on the credit side of the gas fire balance-sheet.

Cookers.

When we come to consider the domestic cooker, it will be found that this gas appliance occupies an even more pre-eminent position than the gas fire. The coal-fired kitchener is neither convenient nor efficient; and despite the fact that coal is still a relatively cheap fuel, it is not particularly economical. I suppose most modern houses are equipped with gas cookers whether there is a coal range or not, while few are provided with electric equipment. I do not propose to dilate on the advantages or conveniences of the gas cooker, but to justify the claim I have made for it by showing how economical it is to operate, and especially the advantage which it shows on comparison with the electric cooker. The latter, being a very recent production, is sometimes mistakenly thought to be the last word in cooking apparatus.

With gas at 8d. per therm, it is possible to cook three meals a day for six people for the expenditure of only 2d.; and it costs but ½d. to boil 4 pints of water, and ¾d. to bake six 2-lb. loaves. In the case of the electric cooker, it is claimed that domestic cooking can be performed for the expenditure of energy of one unit per person per day. A considerable number of tests which we have carried out with electric cookers have justified this contention, so that, whereas with the gas cooker it costs 2d. per day to cook three meals for six persons, with the electric cooker it costs 6d. per day with electricity at 1d. per unit.

To-day it is almost as cheap to cook by gas as it was in 1914. This is the result of the improvements which have been effected in gas cooker design since the war. The design of the gas oven has been completely modified. The flue outlet has been taken from the top to the bottom of the cooking space, and arrangements have been made to lead the products directly out of the bottom of the oven. By this modification not only is the heating efficiency of the appliance raised, but its cooking efficiency is also increased. There is a large reduction in the amount of air which flows through the oven, and as a consequence the steam content of the cooking atmosphere is increased. This, in its turn, ensures the production of better baked bread and better browned joints. Again, the modification of design which was produced enabled automatic control of the gas cooker to be effected. With the most modern type of gas cooker it is possible for the housewife, after setting the "Regulo" in accordance with the instructions issued by the makers, to light the oven, insert the food, and pay no further attention until the allotted time has passed. Then, on removing the food from the oven, it will be found perfectly cooked. When you remember that the roasting of a joint may occupy 2 hours, you will realize what a saving in time automatic control effects. Further, the knowledge that the results which will be produced are independent of any vagaries on the part of the user, or changes in the fuel supply, is a distinct asset. By means of automatic control it is possible for a totally inexperienced person to produce correctly cooked food.

Great though this advantage is, it is not the whole story. Experiments which have been carried out recently have shown it to be possible, with a certain design of gas oven, to cook automatically, and that, further, a wide range of dinner menus, consisting of a considerable variety of dishes, can be prepared with the one setting of the "Regulo;" all dishes being inserted in the oven at the one time and removed together. Under these conditions it is possible for the housewife to leave the cooker to look after the preparation of the meal after the food has once been inserted; and it is not necessary to return to the stove to insert (say) the pudding some time after the joint.

Hotplates.

On the hotplates themselves, by attention to detail, the pre-war efficiency of 25 to 30 p.ct. has been almost doubled. Burner

design has been improved so as to ensure that combustion shall be complete and that spilled food shall not choke-up the flame orifices. Gas consumptions have been reduced so that the loss of gas due to waste and carelessness on the part of the user has been minimized. You are all aware that it is common practice under domestic conditions to leave kettles boiling longer than is absolutely necessary. This involves a waste of gas. If the gas burner is taking 30 c.ft. per hour, the waste is twice as much as with a burner which consumes only 15 c.ft. per hour. Yet, though such large reductions in burner consumptions have been made, a sufficient increase in efficiency has been effected to ensure that the time for any particular operation shall not be increased. A gas cooker hotplate is a powerful appliance, capable of performing its work quickly—a feature of especial advantage in the preparation of breakfast in the morning. The makers of electrical cookers have not yet learned how to make satisfactory hotplates; and in the cases of such appliances that we have tested, they have been found to be slow in operation and relatively inefficient. Whereas a 50 p.ct. efficiency is attained with gas cooker hotplates, several well-known electric cookers showed an efficiency of only 35 p.ct. When it is remembered that, with gas at 8d. per therm and electricity at 1d. per unit, the heat available in the supply is going to cost 3·6 times as much in the case of electricity as in the case of gas, and that the efficiency of the electric appliance is only two-thirds that of the gas appliance, it will be realized that boiling on the electric hotplate will cost some five times as much as on the gas hotplate. To overcome this defect of the electric hotplate, certain makers have devised electric kettles. These give an efficiency of some 85 to 90 p.ct.; but even with them the boiling of water costs twice as much as on the gas cooker hotplate. They are also not very reliable in use. This, however, is probably a defect for which further experience will enable a remedy to be found.

Comparing the most efficient type of gas cooker with the most efficient electric cooker, and assuming the fuel cost to be 8d. per therm for gas and 1d. per unit for electricity, a prolonged series of tests has yielded the following results:

Operation.	Costs.
Cake baking	Electricity costs 2·2 times as much as gas
Mutton roasting	" " 3·0 " " "
Bread baking	" " 4·1 " " "
1st menu	" " 2·8 " " "
2nd menu	" " 3·0 " " "
3rd menu	" " 2·9 " " "
4th menu	" " 3·2 " " "
5th menu	" " 3·3 " " "

Thus, the average for all purposes is that the best electric cooker costs three times as much to operate as the best gas cooker on the price basis mentioned above.

For the purpose of these tests there were used several electric cookers and a variety of gas cookers; and it was found that even when compared with the least economical gas cooker, the best electric cooker costs twice as much to operate—the gas cooker employed in this case being one of the old unpacked slot type.

Quality of Cooking.

With regard to the quality of the cooking, there was nothing to choose between the results attained with either type of oven, provided care was taken with the electric cooker to ensure that the interior of the food was properly cooked. This reservation is of particular importance, as there is a tendency with the electric oven, when it is operated strictly in accordance with the maker's instructions, to produce food which is somewhat uncooked in the interior. The loss in weight recorded during a test is a useful indication of the thoroughness of the cooking. It was found that there was much the same loss when the cooking was done in the electric oven as in the case of the gas oven. The figures were slightly in favour of gas; and when the weight of dripping collected is taken into account, the gas oven shows a distinct advantage. Apparently, owing to the high temperature at the bottom of the electric oven, stewing of the dripping occurs, which results in some decomposition and loss. With the latest type of gas oven, the dripping collected in the tin is found to be of a pale cream colour, indicating that no decomposition has taken place.

It has been mentioned already that gas ovens can be obtained with automatic control, which, of course, renders them much simpler to operate than the electric appliance.

The electricity industry is undoubtedly making strenuous efforts to obtain a certain portion of the cooking load, and the manufacturers of electric appliances are sparing no effort to perfect their apparatus. The gas industry, however, is not asleep, as will be realized from the improvements which have been indicated as having taken place since the end of the war. The position at present is that, unless the electricity undertakings can supply energy at a cost per unit which is only 1-24th that of the cost of gas per therm, then cooking by electricity will be dearer than cooking by gas, assuming the most efficient type of appliance is used in each case.

The Chairman said they were much indebted to Dr. Hartley for his interesting paper, which showed how brains were being applied in research work. In connection with conferences and meetings of the Association which he himself had attended, he had visited various works, and had been astounded to see the number of processes in which use was made of gas.

DISTRIBUTION AND MAINTENANCE SYSTEMS AS CARRIED OUT AT WALLASEY.

By J. H. Crowther, Engineer and Manager of the Wallasey Gas Department.

A year ago, when it was the intention to hold a conference at Wallasey, I was invited to submit a few notes of our methods of rendering service to gas consumers. During the intervening period, things have happened which we are trying to forget; and I hope we are all back to normal working conditions. To a great extent the publicity work of the British Commercial Gas Association was suspended for several months; but the opportunity of a rest in this direction was utilized for review and preparation, and recently the full activities of the Association have been resumed. As I hope all undertakings here represented are subscribing members of the Association, I need say nothing more of the work done by the Association. Should we have any present who are not members, I trust they will shortly become converted, and will lend their active support to the Association.

Maintenance Essential.

I think I am correct in stating that all are convinced that a maintenance system is necessary; the only differences of opinion being as to the method of working. Together with maintenance is bound up the question of charge for gas supply, which, with municipal undertakings, should not be a difficult matter to arrange on a sliding-scale commensurate to a considerable extent with service rendered. The object of submitting some particulars of the service given to gas consumers in our own district is to create a discussion to enable us to compare various methods adopted by other members. There is no pretension of novelty. I am fully conscious that our service is far from being complete, and I feel convinced that if we are to retain and increase business it will be necessary for us to make our service fully complete.

Census.

During the war period, when fuel rationing was brought into operation, it became necessary for us to furnish certain information regarding gas consumptions; and we decided—though short staffed—to tabulate information regarding the number of rooms in houses, and the number and description of appliances installed. These particulars have been found very useful for reference purposes when looking for extension of business, and they obviate unnecessary canvassing.

Showroom.

When the building in which we are now meeting was planned, we were asked to specify, within certain limits, our requirements, and we obtained a room for cookery demonstrations and similar purposes, also a room for an official of the department to receive inquiries and complaints for transmission to the works. Previously such inquiries were made to the rental department, and we were not sufficiently advised as to the nature of the trouble and the work necessary to be done. This room has been utilized for the purpose of displaying gas appliances, and though consumers with a grievance are perhaps not in the best mood to become purchasers, we have found that the show of appliances serves a useful and profitable purpose. Recently, in co-operation with Radiation Ltd., we have extended our opportunities for the display and sale of appliances by means of an up-to-date type of showroom in the centre of the district. Any member who can make it convenient to visit the room will be welcomed by the representative in charge.

Complaints.

In common, no doubt, with other members—especially those engaged by municipalities—we have often heard voiced general complaints of the poor quality of the gas, without any specific instances being given. When those complaining are asked for a case in point, the answer will probably be "all over the borough," which we know to be incorrect. It was therefore decided to advertise in our local papers—a prominent advertisement, not put away in the corner—inviting consumers to inform us of any trouble or deficiency in the supply, and tendering our assistance. I was surprised to find few responses, and felt justified in assuming that the position was not as represented, but, on the other hand, that consumers were reasonably satisfied.

I am pleased to say that we have heard little about "poor gas" since the insertion of the invitation to consult us direct. The almost universal adoption of gas for cooking, and the simultaneous use of the same on Sunday mornings, did undoubtedly tax our mains capacity; and we decided to instal a trunk line of high-pressure mains through the heart of the district, together with distribution governors. This for the time has overcome the lack of pressure, and the system is capable of extension by the installation of additional governors,

and by connecting these to the low-pressure distribution system. Some replacements of low-pressure mains will become necessary as the demand for gas increases.

Methods of Increasing Consumption.

Prior to the war, we loaned free of rental certain sizes of gas fires; the consumer paying for the cost of fixing, which was done by local plumbers and gasfitters. By this system we hoped to popularize gas fires, and to get the plumbers interested in our work, so that they would advocate the installation of additional fires on purchase, prior to carrying out decorations. I am not satisfied that our hopes were realized; and as the cost of fires became prohibitive for loan without rental, the practice, except so far as change of position of fires already on loan, has been discontinued.

To a limited extent we let fires out on the simple-hire system, but our chief business is on the hire-purchase and purchase methods. All fires are fixed by our own staff at an inclusive price, except in the case of fires on simple hire, when the cost of fixing is charged to the consumer. With the exception of gas coke or other similar smokeless solid fuel, I know of no economical substitute for coal comparable with the gas fire; and I consider it would be unwise to lose any opportunity of pressing forward gaseous fuel for heating purposes. We cannot afford to be too conservative in the matter. Our competitors are only too ready and anxious to secure the business at preferential rates for heating, whereas we, on standard rates, can give to the consumer much better results for the money expended. I am not in favour of the supply of gas fires on simple hire, and find we can do a substantial business on hire purchase and direct sales.

Wash Boilers.

In many of the houses where prepayment meters were fitted, we found there was no means of obtaining hot water except by means of the back boiler of the coal fire, or from the cooker hotplate; and as this latter method could not be conveniently applied where large quantities of water were required for baths, &c., we decided to instal 10-gallon wash-boilers with draw-off taps—no initial charge being made, but, by agreement, the meters being adjusted to supply 20 c.ft. for 1d., instead of 26 c.ft. After the consumer had repaid by consumption the cost of the outlay, the meter wheel was changed; the wash-boiler becoming the tenant's private property. Many hundreds have been supplied under these conditions, with results satisfactory to both sides.

A similar system has been adopted to supply gas to small property where there are no house pipes, and where the owners are not prepared to furnish supplies. With the consent of the owners, pipes are run and supplies given; the consumers agreeing to take gas at the 20 c.ft. rate until we have recouped ourselves on the outlay, after which the 20 c.ft. wheels are changed for 26 c.ft. wheels.

Scale of Charges.

For the past twenty years we have had special rates for gas used for power purposes. We have recently adopted a sliding-scale of charges for gas used for all purposes; each quarter being a complete period for calculation, instead of the previous method of annual adjustment. The general basis on which the reductions have been arrived at has been to take what are practically standing charges, such as meter inspection, rentals, &c., department charges, meter and service repairs, rates, &c., and obtain the average of such charges per consumer. We then took the average consumption, and assumed a figure somewhat above this as meeting the cost of supply on distributing account.

As the standing charges previously mentioned cost little, if any, more for a larger consumption at one point, it was decided to give the consumer to a great extent the benefit, and charge more nearly according to the service rendered. By this means we hope to induce consumers to make further use of gas where they have facilities for so doing. I know this scheme is "crude" and incomplete, and I for one am looking forward to the report of the Special Committee set up by the National Gas Council to investigate the subject fully.

Appliance Inspection.

We employ a staff for the purpose of house-to-house inspection, without waiting for consumers to send in complaints. These men are trained gasfitters, capable of taking on any class of work connected with gas consuming appliances. Each man is supplied with a small box of tools—this they prefer to a bag or bass—and a force pump. Their first duty is to test the pressure at the meter inlet; and if this is not found satisfactory, the service is cleared, if possible, by means of the pump. If this cannot be done, an order is passed forward to the service layers' section.

The pressure on the outlet of the meter is tested with the chief gas consuming appliances in operation; and if the pressure drop is considered too great, the meter is examined, and in some cases washed out—we generally use wet meters. If the men are of the opinion that this is unnecessary, and that the meter is too small for the requirements, an order is passed forward to the gasfitting department for a change of meter. Burners, cookers, fires, water heaters, and other appliances are examined, and, where necessary, adjusted, at the one visit. The number of houses visited per man per week is approximately 50. It will at once be seen that, to undertake the work outlined, a competent fitter is required, to obviate unnecessary visits. For a time, consumers somewhat resented the men's calls, and were probably of the opinion that there was some "catch" when they were offered free service. I think we may now say that any such suspicion has passed, and the inspectors are welcomed where their services have given marked improvement in lighting and heating results. It is gratifying to the department when we are told "That was a good man who called to put our gas right."

I feel sure that this work must be extended, though it may mean a slight addition to the initial charge for gas. The maintenance inspectors are a means of bringing in orders, or giving information so that cases may be followed up and orders secured by the salesmen. One of the points it has not been easy to get the men to understand is that, while we welcome orders for new appliances, it is better to retain and satisfy the consumers we already have than to gain new consumers at the expense of neglecting the old.

FURTHER DETAILS OF THE DISTRIBUTION AND MAINTENANCE SYSTEMS.

By H. B. Holliday, Assistant Engineer to the Wallasey Gas Department.

The estimated population of the County Borough of Wallasey is 92,000, and the area of the Borough is 3408 acres, comprising the former townships of New Brighton, Poulton, Liscard, Seacombe, and Wallasey Village. The County Borough was constituted in 1913.

During the summer months the demand for gas for cooking at rush hours is very heavy, especially at the New Brighton end of the Borough, and special attention became necessary.

In the past ten years the population has increased from 53,580, and the gas undertaking, which had then a total output of 720 million c.ft., has this year practically reached the figure of 1000 millions.

The gas-works are situated on the inland boundary of the Borough between the Great Float and the London, Midland, and Scottish Railway. The storage holders at the works are of a capacity of 4 million c.ft., against which the maximum output for 24 hours during this year has been 3¾ millions, and the peak load, occurring between 11 a.m. and 1 p.m. on Sundays, at the rate of 9⅛ million c.ft. per 24 hours.

Maintaining Adequate Pressure on the District.

The district was first divided into three sections, two of which were supplied by 30-in. Braddock governors, and the third by a 24-in. Braddock governor, all situated at the gas-works. The three feeder mains supply gas to their distinct sections, and finally couple up on the arterial system.

During the years 1920-22 much difficulty was experienced in maintaining pressures at the New Brighton end of the district, especially during week-ends and at rush hours for cooking. Much building work was carried out in the outlying parts of the borough, all of which helped to increase the peak loads, and so overwork the feeder mains.

To overcome this difficulty it was decided to instal booster or high-pressure mains to carry gas direct to the affected sections, and so relieve the load on the works governor. Three steam-driven gas compressors of the Waller type, each of a capacity of 6000 c.ft. per hour at 5 lbs. per sq. in. pressure, were installed, together with over five miles of steel booster main, 12 in., 9 in., and 6 in. diameter, to supply nine 6 in. diameter high-pressure governors of the Bryan-Donkin "Reynolds" type, which are automatically set to deliver such quantities of gas into the distribution mains as will maintain the required pressure of 3 or 4 in. of water.

During periods when the demand is low, the district pressure is maintained at all parts of the borough by the station governors at the works; and the high-pressure governors remain closed. Immediately the pressure falls, however—due, of course, to demand tending to exceed the available supply—the compensating gear of the "Reynolds" governor commences to function, and the high-pressure governor opens to allow regulated quantities of gas to pass into the district mains. These governors are designed to act as reducing pressure valves, so that the pressure on the outlet into the district mains can never exceed the requirements of 3 or 4 in. of water, though supplied from the compressors by gas at 3 lbs. per sq. in. on the inlet side, or from holder pressure direct when the compressors are not working.

The compressors are automatically governed, and set to supply at 3 to 4 lbs. per sq. in. They work against a weighted by-pass or return valve through a pressure cylinder of 5 ft. 6 in. diameter by 19 ft. long, which acts as container and also as collector for liquid deposits from the gas after compression.

Though not supplied by the contractor, it was found very necessary to provide each compressor engine with an efficient

steam governor of the "Pickering" type, to guard against dangers of racing, &c., especially at times when the output necessitates the use of two sets of compressors. Normally one set is required from 7 a.m. until 8 p.m., and a second set is put on during peak loads—usually for two or three hours during cooking periods. The station governors maintain a steady pressure of 35 tenths at the works from 7 a.m. to 11 p.m., after which a reduction to 22 tenths is effected by gradual stages.

This arrangement is proving efficient; and supplies of gas at constant pressure are obtainable at all parts of the district. The system can also be greatly extended as future demand increases, and extra high-pressure governors can be installed at necessary points in the distribution system.

Demand for Gas at Wallasey.

The demand for gas at Wallasey is almost entirely domestic, as the whole area is residential, being referred to locally as "the bedroom of Liverpool." During the summer months many visitors arrive, and help to increase the cooking load—especially in the New Brighton district.

The comparative outputs during the winter months (October to March) and the summer months are now about in the ratio of 60 : 40; and as the season in New Brighton and Wallasey becomes more popular, the summer load will be increased.

There are at present in use 19,967 cookers and nearly 10,000 gas fires, water heaters, geysers, &c.—which figures represent a good proportion of the total population of 92,000. There are also 37 gas engines, exclusive of six at the gas-works, in operation; but little progress seems possible on the industrial side, for the reason before mentioned.

New Scale of Charges.

A new scale of charges has recently been introduced, as explained by my Chief, Mr. J. H. Crowther, under which the domestic consumer can now benefit in the same manner as the user for power purposes did previously.

The scale now in use is as follows:

For the first 22,500 c.ft. per quarter, at the rate of 3s. 4d. per 1000 c.ft.

For excess consumption over 22,500 c.ft. and up to 37,500 c.ft. per quarter, 3s. 2d. per 1000 c.ft.

For excess consumption over 37,500 c.ft. and up to 62,500 c.ft. per quarter, 3s. 1d. per 1000 c.ft.

For excess consumption over 62,500 c.ft. and up to 125,000 c.ft. per quarter, 3s. per 1000 c.ft.

For excess consumption over 125,000 c.ft. and up to 250,000 c.ft. per quarter, 2s. 8d. per 1000 c.ft.

For excess consumption over 250,000 c.ft. and up to 500,000 c.ft. per quarter, 2s. 2d. per 1000 c.ft.

For excess consumption over 500,000 c.ft. per quarter, 1s. 11d. per 1000 c.ft.

The supply to be from one service pipe.

As previously stated, the maintenance system includes periodical inspection of all appliances, adjustments, and regulations, free of charge. To carry out this work for the 21,000 consumers, a staff of six men is now employed—the borough being divided into as many sections. This number of men will be increased as suitable occasions arise.

The greatest difficulty has been experienced in finding out exactly which consumers have had trouble with gas appliances due to no report or complaint being made to the Department. On numerous occasions cookers, fires, and boilers have been "unearthed" which have been condemned by the consumer as useless, all for the sake of either cleaning or simple adjustment.

Men Employed.

The men employed have been carefully selected, as it will always be found that in this class of work the human element is the heart of the system, and the man employed must be a trained gasfitter capable of doing and also of explaining.

The system is now in full swing, and results are pleasing. The men are in special uniform, and report each morning to the office, in addition to sending in a written report of each visit, setting-out all work found necessary. In this way a connecting link is forged directly between each consumer and the department.

Showroom.

The general layout of the borough is unique, as there is no main road or district area which can be called the shopping or marketing centre, so that the problem of showing gas appliances has difficulties. Recently a showroom, fitted on modern lines, has been provided in co-operation with Radiation Ltd., and opened in the most central part of the district, where different types of appliances and fittings are displayed and explained; and under arrangement, early delivery of new cookers, fires, &c., can be promised. This showroom has provided a direct link between the consumer and the department, and on account of its position offers facilities for a call without undue trouble to a large proportion of the public, in addition to making possible, by internal arrangement and automatic lighting control, an efficient and attractive advertisement at all hours.

Naphthalene.

Any paper dealing with distribution topics would not be complete without some reference to naphthalene treatment. The gas supplied by the Wallasey undertaking is manufactured almost entirely in modern vertical retorts. Unfortunately we have not experienced that highly desirable condition—naphthalene-free gas. After experiments with washing agents and carriers of varying odours, the most efficient treatment from the naphthalene extraction point of view has been found to be washing the gas at the works in a rotary brush-type washer with petroleum oil.

This washer is situated at the inlet to the oxide purification plant, and the use of about 10 gallons of oil per million c.ft. of gas has kept the naphthalene content of the gas supplied at less than 1 grain per 100 c.ft. We have also experimented with "Solvene" spray under water pressure, and still employ this method in the pressure cylinder on the high-pressure plant at the gas-works. Steam and direct-fire atomizers of the coil type have been used on the district; but much work, and complaints of smell, &c., resulted, with little benefit. The vapour quickly condensed out again without any useful function as a "carrier," and this necessitated extra pumping of surrounding syphons and the disposal of the pungent effluent.

The present system of oil washing on the works and the extraction of the naphthalene before distribution has allowed us to discontinue treatment on the district, and has kept the "complaints book" return within reasonable limits; but we have recently experienced a new source of trouble on the district, due to the finding of quantities of oily deposits together with water in newly-installed dry meters. We are not yet able to state definitely whether these deposits are from the oil washing process or from "Solvene" spray; but the problem, together with that of gas drying before distribution, is now under consideration. It would appear from calculations and direct investigation that some form of gas drying is necessary, especially in cases of steamed vertical gas, to reduce all risk of rust formation in mains and services.

Discussion.

Mr. Cook (Southport) said he had been much interested in the method adopted in Wallasey for the distribution of gas. It had been his privilege to serve under Mr. Crowther. He began as his pupil in 1907, and served as Technical Assistant and Chief Assistant up to four years ago. At present he was the Deputy Engineer at Southport. Mr. Crowther had spent a great part of his life for the benefit of the town, in designing the gas-works at Wallasey. He looked years ahead, and with excellent judgment made provision for extensions, not only during his own period, but also in the time of those who would follow him. He was a keen business man and a splendid engineer. That was said from an intimate knowledge of the progress which had been made by the Wallasey gas undertaking during the past eighteen years. No other official of the Corporation had sions, not only during his own period, but also in the time of those always been among the lowest in the country, and, in addition, contributions had been made in aid of the rates which, he understood, amounted to approximately £400,000. The loan debt was about £255,000. So it appeared that, if all the profits had been allocated to the reserve fund, instead of being applied to rate aid, the debt would have been wiped out, and a very substantial balance left. It was a wonderful achievement. The works was now among the most up-to-date in the country; the efficiencies obtained all round being of the highest order.

Mr. O. Evans (Wrexham) said the undertaking he represented was a very small one in comparison with others represented at the conference. Their contribution was only £40 to £50 a year. By themselves they could not afford to pay for advertisements in the periodicals which figured in Mr. Mason's list; but they participated in the benefits which accrued from the Association's advertisements, and in that way were amply repaid for the contribution they made to its funds. Mr. Crowther's paper set forth an interesting maintenance scheme. In Wrexham they adopted a scheme and dropped it, and then took it up again; and there was no doubt they were deriving a large amount of benefit from it. It was no use waiting for the consumers to make complaints to the officials of the undertaking about the quality of the gas, and so forth. They would not do that; but they complained outside. The method adopted in Wrexham was to send men round periodically to examine the fittings.

Councillor Starkey (Warrington) said that in his town the interests of the consumers were looked after very well. If a complaint was sent in, it was attended to immediately; and the people generally understood that this was what they should do.

Mr. Crowther, in replying to a question, stated that at present the cost of the method he had described was about 1d. per 1000 c.ft.

Mr. G. Dixon (Lancaster) said he concurred in the tribute paid by Mr. Cook to Mr. Crowther. He himself owed to Mr. Crowther more than he could express, because it had been his good fortune to serve under him for many years. The experience he gained through his association with Mr. Crowther had stood him in good stead. Personally, he was one of those who considered that there ought to be more "punch" in the advertisements. Those issued by the electrical people appeared to strike harder than many of those which the Association put in periodicals. Consumers would not come forward with their complaints. Some years ago his department issued a notice asking that complaints should be sent to the office; but it did not appear to have any effect. As to the suggestion that men should go round to the consumers, it was difficult in industrial towns to get the right class of men.

Mr. Mason said Mr. Dixon had been a very keen member of the Association, and since he went to Lancaster had brought the people

there to the right way of thinking. All advertisements were passed by the Executive Committee, which was a representative body.

Mr. Crowther remarked that he thought there had been a falling-off in the character of the advertisements, which had too much print about them. There was no clear indication at first sight that gas was advertised; and one had to go close up to see what was said.

Mr. S. Meunier (Stockport) thought that if Dr. Hartley's paper was put into language which the man in the street would understand, it would be a great help. He was interested in high-pressure distribution. For twenty years his out-districts had been supplied by means of a system similar to that described by Mr. Crowther. He believed the distribution of the future would be upon these lines. Service was the great desideratum to-day; the consumer had to be satisfied. To put upon bills or circulars a notice inviting complaints had little effect. Two years ago Stockport took the matter in hand, and notified the consumers in a particular district that in about two days' time a representative would call to inspect the fittings and apparatus; and if the consumer had any complaints to make, or was dissatisfied with anything, or did not understand any particular part, he should call the attention of the Department's representative to it. When there were complaints, men were sent to put the matter right. All this was done without charge; and in the past eighteen months the expenditure of the Department in respect of that free service had been over £1000. But the men sent out came back with orders for appliances, &c.; and the £1000 was wiped out, and a profit of about £750 made on the supplying of those fittings. The consumers began to use gas in different ways, and wanted more of it. So that system had been very successful, and was being continued. They hoped in course of time to enlarge the scope of it, and make visits periodically. If they brought home to the consumer directly the benefits of gas and its uses for heating and cooking, as well as for lighting, there would follow a better demand for appliances of all sorts, and an increased consumption of gas. During last year—1926-27—the output of gas increased 15 p.ct. over the previous year, which itself was 10 p.ct. better than its predecessor. The improvement was doubtless brought about to a certain extent by publicity and attention to the consumer.

The Chairman said he was impressed by the absolute fairness which Dr. Hartley had shown in his paper.

LUNCHEON.

Alderman Evans presided at luncheon in the Town Hall (at which the delegates were the guests of the Wallasey Corporation), and proposed the Loyal Toast.

Councillor H. M. Alderson Smith (Vice-Chairman of the Gas and Water Committee) proposed the toast of "Our Guests." He said gas had its distinct sphere; but the public had to be told how it could be used, and the advantages it offered. Publicity and propaganda work were needed; and the object of the "B.C.G.A." was to take united action.

The toast was responded to by Alderman Brewster (Stockport).

Mr. H. Wade Deacon, in proposing "The Success of the Gas Industry," said he could put before them some figures which showed the success that had been achieved in Wallasey. In 1891, when Mr. Crowther went there, 66 men were employed, 14,000 tons of coal were carbonized, and 140 million c.ft. of gas were supplied. The figures in 1926 were 250 men, 62,000 tons of coal, and 1000 million c.ft. of gas. In that period the population had increased from 33,000 to 93,000—not quite three-fold, whereas the gas consumption had increased seven-fold. No doubt much of the credit for this improvement was due to Mr. Crowther. Last year the gas industry passed through a very bad time; but it was still "going strong." A Professor of Columbia University had published a book in which he stated that the consensus of opinion, among those who had given serious thought to the matter, was that the time would come—probably in his generation—when gas would be practically the universal fuel.

The Mayor, responding, said the Wallasey gas undertaking was mainly dependent upon the domestic consumer; and he believed the demand for heating and cooking purposes would increase. Both electricity and gas would benefit by amicable co-operation.

The Chairman said gas had got a good start, and meant to maintain it. He wished to take this opportunity to pay a tribute to the whole of the workers in the gas and water undertaking, from the Engineer downwards, for the ungrudging and devoted service they gave during the coal stoppage. Mr. Crowther and Mr. Caunce (the Chief Clerk and Commercial Manager) spent unnumbered hours, and used every expedient, to procure coal. The Assistant Engineers (Messrs. Holliday and Scott) experienced daily difficulties in dealing with mixed classes of fuel and ably surmounted them. The technical staff, including Messrs. Bibby and Watson, rendered yeoman service.

Alderman J. McMillan (Chairman of the Finance Committee) said the success of the Wallasey gas undertaking was undoubtedly due in very large measure to the indefatigable energy of the Engineer. As an outsider, he looked critically at both gas and electricity; and as far as heating and cooking were concerned he was convinced that gas could beat electricity. They must make sure the plant and appliances were in order, and that the capital expenditure was right. Then there was every prospect of success for the gas industry.

The toast of "The Chairman" was proposed by Mr. Mason.

The afternoon was devoted to a public conference at which the question of "Atmospheric Pollution" was considered. Alderman Evans again presided.

REMEDIES FOR SMOKE—PROBLEM AND PROSPECTS OF CLEAN AIR.

By Dr. T. W. Naylor Barlow, O.B.E., F.R.S. (Edin.), Medical Officer of Health for Wallasey.

[Extract.]

After outlining the serious injury inflicted on health and property by smoke from factory and household chimneys, and emphasizing its cost to the community, Dr. Naylor Barlow said he was fairly confident that the problem of the factory smoke was on the way to solution. With regard to house smoke, the difficulties were greater, since practically all houses except those built within the last two or three years were fitted with grates of a pattern now out-of-date, which would not burn smokeless fuel. "I think we can take it for granted," he added, "that we shall not get people to burn smokeless fuel for the simple reason that the fuel is smokeless. There must be other advantages in the way of economy, efficiency, and convenience; and until these advantages can be shown, people will continue to burn soft coal." Local authorities might, it had been suggested, take a share in grate reform, insisting that in all new houses grates should be of an approved pattern—a suggestion worthy of consideration. In addition, there was the difficulty of producing a smokeless solid fuel; but he hoped for a solution from the gas undertakings. For heating, gas fires were clean, convenient, and efficient; but they cost more than coal if used continuously. They were non-injurious to health if properly ventilated. While he gave electricity the palm for lighting, "its uses," he said, "for cooking have been much boomed, but it is expensive; while in my view it cannot compete with gas for heating, owing to the price."

Dr. Naylor Barlow concluded by appealing for stronger public opinion against air pollution, and said "the solution of the house smoke difficulty lies in the increasing use of gas fires for heating and cooking, and in the provision of a satisfactory smokeless fuel—cheap, efficient, and convenient—with a satisfactory grate in which to burn it. The beneficial results which would follow a clean atmosphere are such as ought to be sufficient to spur on the efforts of all who can help—housewives, engineers (including gas engineers), inventors, not excluding the man in the street, who, by helping to form a strong public opinion, can spur on the efforts of those whom I have just named."

COAL SMOKE AND ITS CURE.

By Edwin Upton, Treasurer of the Liverpool Gas Company.

[Extract.]

All hope to see industry grow, and expect the increase to be smokeless, through the adoption of methods which are cleaner and more in keeping with modern thought. The tabulated trades of this country using gas amount to some 3000; and exploration shows that the average number of processes in which gas can be used is 7. There are, therefore, about 21,000 industrial uses for gas developing day by day, all of which, it would be safe to say, are capable of producing great indirect economies in manufacture, and which, while improving inside conditions for industrial workers, must at the same time add to the amenities of town life, through a cleaner atmosphere. In the next decade or two we ought to be absolutely free from factory smoke.

It is recognized that what is discharged into the atmosphere from the millions of our open coal fires is much more dangerous to health and wealth than is factory smoke. It has been computed that domestic smoke is responsible for three-quarters of the total smoke problem, but for more than three-quarters of the total smoke damage.

Gas Increasing Sunlight.

It is said that the loss of solar radiation in London is 40 p.ct. between November and April. We know that the deficiency would be much greater but for the larger modern use of gas and coke, as can be seen by the following comparison. The population of the United Kingdom during the last decade increased by 4·7 p.ct., but the sale of gas increased by 25 p.ct., while the number of consumers grew by 14 p.ct. This is evidence of progress, and an indication that gas-works will inevitably play a larger part in the life of the people. Is there any doubt of this after the wonderful part played by the gas industry throughout the unprecedentedly long coal strike which it was our misfortune to suffer recently? In 1912 the London sootfall was 76,000 tons, and in 1923-24 35,000 tons—a considerable decrease, but a quantity still sufficient, it is said, to cover Hyde Park (an area of nearly 400 acres) to a depth of 11 in. This striking sootfall decrease is coincident with London's increase in the use of gas; and what applies in this respect to London, will apply elsewhere.

Coke and Gas the Solution.

The part gas is playing in the solution of the smoke problem should be aided by the more general use of coke, and the independent coke boiler. With thought on the part of manufacturers, backed by the co-operation of gas undertakings and/or local authorities, I feel confident that the independent coke boiler could be brought into general use in this country. It provides an abundant supply of hot water, contains a hot-plate, makes a pleasant fire with open doors, and performs the function of a refuse destructor. It is also probably capable of heating a bathroom towel-rail, and one, or even two, radiators, and should provide means for amply drying and airing clothes—a necessary function in a climate like ours. Much,

but not all, of this can be achieved at present by the independent coke boiler—a simple apparatus, saving, it is alleged, one-half the weight of fuel which would be used ordinarily. With a gas cooker installed alongside in place of the old kitchen range, and gas fires in other rooms, the saving in labour is equalled only by the improvement in atmospheric conditions.

Local authorities now being health and housing administrators, the idea is well worth development. There would be large savings in building cost, as well as the provision of larger rooms through the elimination of chimney breasts and excessively large flues. It would mean, of course, the departure of the out-of-date kitchen range and of open grates, as well as of unsatisfactory back boilers. Incidentally, it would mean the departure of bathroom disappointment, as under present general conditions the one lucky bather usually takes all the available water, leaving the remainder to manage as best they can.

This nation can, and in time will, overcome the smoke problem. It is safe to hazard the opinion that all solid and gaseous fuels for domestic use will be derived from coal distillation, and that gas undertakings will become the distributors of such.

The paper written by Mr. Upton was read by Mr. Stubbs.

Discussion.

Mr. Cook (Southport) said this was a national question of vital importance. Dr. Barlow had told them clearly and forcibly how health was impaired through the vitiation of the atmosphere by smoke, and Mr. Upton had shown how the gas industry had helped to reduce atmospheric pollution. It appeared to him (Mr. Cook) that during the next decade the gas industry would do still more.

Mr. Mason said that perhaps the time would come when, instead of laying hands on the surplus profits of the gas undertaking, the municipality would consider the advisability of subsidizing the gas department, and enabling gas to be produced so cheaply that people would have the strongest motives for using it.

Mr. Shaw emphasized the need for proper ventilation of gas cookers. They should be fixed in such a manner that the products of combustion could be carried outside.

Councillor Starkey (Warrington) suggested that something might be done for people who could not afford the cost of separate fires for heating and for water-heating. A boiler could be put behind the gas fire.

Dr. Barlow observed that the products of the combustion of gas were the same as those which arose from the breathing of human beings. Many people refused to give up the open fire, but would be willing to burn a fuel which did not emit smoke. The ordinary grate would not burn coke; and it was a question whether it would not be worth while for the Corporation to spend some money in making alterations to the grates, to enable smokeless fuel to be burned. He had recently been testing a stove which seemed to burn coke most effectively.

Mr. Mason moved a vote of thanks to the Wallasey Corporation, the Gas Committee, the Chairman, the authors of papers, and others who had contributed to the success of the conference.

Mr. Williams (Altrincham) seconded the resolution. He remarked that these meetings were valuable from an educational point of view by enabling them to exchange experiences, and hear what others were doing. On this occasion they had had the advantage of hearing the consumer's side.

The Chairman, in responding, said he believed the solution of the problem would be found in the increased use of gas, and also of electricity for certain purposes. Ordinary people could not be expected to have an all-electric or an all-gas house. In one instance at least the Corporation had to take out the electric appliances. The success of the conference was largely due to Mr. Mason.

The conference then terminated.

[An exhibition of gas appliances had been arranged in the Gas Offices in the Town Hall; and an illustrated description of this and of the showrooms in the heart of Wallasey will be given in the "Gas Salesman" to be published on the 13th instant.]

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

Visit to the Dundee Gas-Works.

The Association visited the Dundee Corporation Gas-Works on March 26. They were received by Mr. J. Dickson (Engineer and Manager), Mr. Hislop (Assistant Engineer and Manager), and other members of the staff.

The Inspection.

It was observed that extensive alterations were being carried out on the site of the old purifying plant, with a view to the installation of new purifiers. In the station meter house a feature of interest was a rotary meter capable of dealing with from 20,000 to 200,000 c.ft. of gas per hour. The inlet and outlet connections (30 in. in diameter) were of tinplate. Here also were seen a Beasley recording calorimeter and a Simmance Abady indicating calorimeter. These instruments, in series, are checked by a Peebles and a "Sigma" calorimeter.

Before passing into the retort houses, the visitors were shown the paraffin spraying plant, which has been of great benefit. They were shown four small locomotives which had been in use for 25 years.

The horizontal retort house was then visited. Here there are 38 settings of 12 retorts each, set back to back. On each side there are Arrol Foulis hydraulic charging and discharging machines. Coal from railway wagons, which are moved into position by electric capstans operated by town current, is tipped into the breakers, and by gravity bucket conveyor is conducted to overhead hoppers. From these it is then fed into the small hoppers provided on the Arrol Foulis charging machines. These horizontal retorts are only in use during the winter months.

The visitors next inspected the vertical plant, which consists of three benches of Woodall-Duckham retorts, each bench comprising five settings of four retorts—a total of 60 retorts. The coal from the breaker which serves the horizontal retorts is fed by an inclined conveyor to a hopper, and then by Babcock and Wilcox gravity bucket conveyors arranged in duplicate into overhead bunkers each of 48 hours' capacity. The vertical plant has a capacity of 4,500,000 c.ft. per diem.

In the exhauster house was seen a series of compressors which, through high-pressure mains, supply gas to the outlying districts of Lochee (3 miles), Loons Road and Downfield (2½ miles), and Baxter Park and Broughty Ferry (4 miles). Here there is an electrically-driven exhauster capable of dealing with 500,000 c.ft. per hour; the current being taken from town supply.

The sulphate of ammonia plant is in duplicate; each section being capable of making five tons of salt per day.

The Tar Works.

Following the inspection, the visitors were conveyed by motor coach to the tar works, which are situated about a mile from the gas-works, on reclaimed land adjoining the Tay. Here the party were met by Mr. S. Donald, the Superintendent of the works. The various processes were explained, and the Wilton dehydrating plant was demonstrated. Interest was evinced in the new installation of Woodall-Duckham tar and bitumen mixing plant. An estimate of the tar products sold during last year is:

Prepared tar	754,166 galls.
Light oil	28,618 ,,
Middle oil	192,599 ,,
Creosote oil	57,301 ,,
Tar and bitumen compound	1,000 ,,
Pitch	1,261 tons

Mr. Darling, the President of the Association, thanked Mr. Donald for explaining the various processes.

Tea.

The party then returned to the gas-works, where they were entertained at tea by the Gas Committee.

Bailie Phin (Convener of the Gas Committee), who occupied the chair, said he was present, on behalf of the Corporation, to welcome the Association. He hoped those present would benefit from their visit to Dundee. He had noted that the Association had now been in existence about 23 years. They were certainly doing good work. There was an old adage to the effect that no man worked for himself alone. They could help one another in all matters, technical and otherwise. It had been said that the Government Electricity Act had sounded the death knell of the gas industry. This was far from being the case.

Mr. Darling said that the thanks of the Association were due to Bailie Phin for his welcome. They were greatly indebted to the Gas Committee and to Mr. Dickson, the Engineer. Every member had thoroughly enjoyed, and benefited from, the visit.

SHEET METAL—ITS RELATION TO THE GAS INDUSTRY.

By David Warden, of the Dundee Gas-Works.

[Extract.]

The National Amalgamated Association of Tin and Iron Plate Sheet Metal Workers and Braziers have a beautiful certificate. Many of the characters shown on this certificate will bear out the contention that there has been and still exists a

strong relationship between sheet metal and the gas industry. Among some of the characters shown is a large gas lantern of neat design, complete with old-fashioned flat-flame burner, a familiar object in the form of a dry gas meter, and a gas cooker and copper boiler combined.

The City of Dundee can claim a unique distinction in these relationship ties, for was it not a Dundee tinsmith who first constructed a gas-making apparatus to light up his own premises, as well as two other places, Moren's inn and Robert Donaldson's book store? He accomplished this in the autumn of 1817. The first Dundee Gas Light Company did not start to lay their pipes in the Seagate of the city until March 13, 1825.

As further indicating the relationship between sheet metal and the gas industry, mention may be made of the huge amount of sheet metal goods manufactured specially for the gas industry—meters, copper wash-boilers, &c.

The Bowl of Water.

In that little booklet, "The Triumph of Gas, 1926," issued by Radiation, Ltd., we encounter the following statement: "A gas grate of the Radiation type needs no old-fashioned bowl of water in front of it." Until recently it was a common plan to place a dish of water in front of gas fires. In the old days people sometimes hung a large wet cloth near the coal stove. Another arrangement consisted of a trough of water, with a roller moving in it, and a similar roller, forming a windlass, about 2 ft. above. A piece of cloth passed over these rollers and through the water. A few turns of the windlass wetted the whole surface of the cloth; and the vapour arising constantly from the cloth made good the want of humidity in the stove heated room.

Ventilation.

Perhaps the earliest expedient for ventilation was that used largely in places of worship. This consisted of a hole cut in the roof of the building; a tube or pipe communicating with the outside air being fitted with a cap or cover, to prevent rain and snow entering through the pipe to the interior of the building.

Among the early experts in ventilation we find the names of Dr. Arnott, Dr. Ure, Dr. B. D. Reid, and Mr. Joseph Fleming. In my early journeyman days I was employed in a large ship shop, principally on ventilation schemes; and it has always been of interest to me that Dr. Reid demonstrated how easily a ship could be ventilated in all its habitable parts. In 1840-1 he was engaged in exemplifying his theory in the vessels destined for the Niger Expedition. From what we can gather, however, it appears that many of the plans in operation in those days for carrying-off used air from apartments were inferior to the means for heating the apartments.

According to official figures, we find that tar, ash, and sulphate are among the things that make the air of our towns and cities dirty; and sometimes these substances are present in astonishing quantities. This may be due to the employment of coal in its natural state for domestic purposes, &c. We may consider dirty air as a factor working against health. We may propose as a remedy the employment of coal gas, burned in appliances properly designed and correctly fitted. If proper means of heating and ventilating are employed in domestic apartments, mills, workshops, offices, and public buildings, both comfort and health would be increased.

Subsequently Mr. Warden demonstrated, with several well-finished models in tinplate, some of the problems which had been met with in the Dundee district in regard to heating and ventilation. Every model represented how the difficulties encountered had been overcome; the work being carried out under Mr. Warden's supervision.

Discussion.

The President said that the models reflected great credit on Mr. Warden, as also did the work they had seen at the station meter house in connection with the rotary meter. The subject of ventilation was an all-important one, and one on which there was not enough discussion at Association meetings. In many of the housing schemes throughout the country, the ventilation was insufficiently considered. One found in modern housing schemes at least one room in each house which had no provision for ventilation.

Mr. Dickson said it was evident that great strides had been made in the work of the Junior Associations since their inception. He was proud to hear one of his own staff read a paper, and was grateful for the able assistance of the whole of his staff, who were most loyal. Mr. Warden, some of whose work they had seen, was thorough. The formation of Salesmen's Circles had done much good. Referring to the Education Scheme, he observed that there were difficulties for the young men who were situated at works away from the approved centres. There should be greater facilities for the lad in the country.

Mr. Duffy (Dundee) and Mr. Short (Kelty) asked questions on condensation and sulphur fumes. These were answered by Mr. Warden.

On the proposition of the President, a vote of thanks was accorded to the author.

ESTIMATING THEORETICAL COMBUSTION TEMPERATURES.

"Das Gas- und Wasserfach" for Feb. 26 gave an abstract of an article on this subject by A. Schack in the transactions of the Wärmestelle des Vereins deutscher Eisenhüttenleute. Hitherto, it states, no simple method has been known of estimating the theoretical combustion temperature of any fuel with a given quantity of air, without experimentally obtaining several approximate values, and so arriving at a mean. The author has discovered that simple formulæ are obtainable if the specific heats of the components of the products of combustion are represented as functions of the temperature from the form $a - \frac{b}{t}$.

The theoretical combustion temperature is estimated from the known formula:

$$t = \frac{H_u + Q}{A.c_{pa} + B.c_{pb} + C.c_{pc}} \text{ °C.}$$

The author has worked out the following formulæ from this:

1. For temperature range between 1100° and 2400° C.

$$t = \frac{H_u + Q + 50{\cdot}4\,A + 103\,B + 190\,C}{0{\cdot}378\,A + 0{\cdot}607\,B + 0{\cdot}565\,C} \text{ °C.}$$

2. For temperature range between 800° and 1800° C.

$$t = \frac{H_u + Q + 32\,A + 80\,B + 75\,C}{0{\cdot}364\,A + 0{\cdot}591\,B + 0{\cdot}477\,C} \text{ °C.}$$

3. For temperature range between 1700° and 2800° C.

$$t = \frac{H_u + Q + 93{\cdot}5\,A + 128\,B + 448\,C}{0{\cdot}400\,A + 0{\cdot}621\,B + 0{\cdot}695\,C} \text{ °C.}$$

In these formulæ

H_u = net calorific value of the fuel in calories per cub.m. or calories per kilogramme [1 cal. per cub.m. = 0·1124 B.Th.U. per c.ft. and 1 cal. per kilo. = 1·7995 B.Th.U. per lb.].

Q = preheating, reckoned in calories per cub m. or per kilogramme of the fuel.

A = Nitrogen and oxygen reckoned in cub.metres (reduced to N T P. of 0° C. and 760 mm. Hg), which results from 1 cub.m or 1 kilogramme of the fuel [1 cub.m = 35·3148 c.ft., and 1 cub m. per kilo = 16·0187 c ft. per lb.]

B = Carbon dioxide reckoned in cub.metres at N.T.P., which results from 1 cub.m. or 1 kilo. of the fuel.

C = Water vapour reckoned in cub.metres at N.T.P., which results from 1 cub.m. or 1 kilo. of the fuel.

The accuracy of formulæ 2 and 3 is said to be greater than the accuracy with which specific heats can be determined at high temperatures; and limits of error by this method of calculating are, generally speaking, within 0·5 p.ct. With the help of the formulæ, it is possible, merely from a knowledge of the net calorific value of a fuel and from an analysis of the combustion gases, to estimate the theoretical combustion temperature (without taking into account dissociation).

SCOTTISH JUNIOR GAS ASSOCIATION

(WESTERN DISTRICT).

Visit to the "Glasgow Evening News and Daily Record" Office.

On Wednesday, March 30, the members of this Association inspected the entire procedure in the printing and publishing of a newspaper in Glasgow. The visit was of special interest, because gas is used to a great extent throughout the offices, and because, with recent alterations, the "Glasgow News" Office is said to be one of the most up-to-date publishing offices in the country.

Mr. D. W. Barr, the General Manager, received the visitors, and gave a full explanation of newspaper work.

The case room was visited, and the use of gas was observed. Attached to each linotype machine was a molten metal pot, kept at a constant temperature of 600° Fahr. by a gas burner. From this pot all the type slips are cast automatically.

The stereo room was next inspected. Here the stereo plates are cast from the flong prepared in the case room. There are three junior autoplates in use, each having a capacity of 7 tons of molten metal. Two are gas fired, and one is oil fired. The temperature maintained is 600° Fahr. during the working period, and 500° Fahr. throughout maintenance. In the stereo room is a special type of gas-heated drying machine which is used particularly to ensure that the flong matrix is perfectly dry before being inserted in the casting cylinder of the autoplate. The stereo plates are transferred to the auto-shaver, where they are trimmed and cooled.

It was also observed that gas was employed in connection with the printing machine; a heater assisting the drying of the ink in cold weather. The work in the zincotype and process departments was of great interest. Gas is in constant use here.

The annual meeting of the Western District will be held on April 9, when Mr. James Macleod will give an address on the "Present Position of Tar and Ammonia."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Price of Gas Oil.

Sir,—While the users of petrol are benefiting by the price-cutting war in petrol between the combine and outside firms, an attempt is being made by the firms who supply gas oil to demand and obtain an increased price for gas oil over the prices ruling twelve months ago.

The reason for this increase is stated to be increase in freight. These freights are in some cases paid to subsidiary carrying companies, so that the money is merely transferred from the right-hand to the left-hand pocket.

It is true that nearly all quotations are subject to fall clauses; but there is not much chance of these operating if the gas industry is prepared to go in and buy now at advanced prices. If, on the other hand, buyers of gas oil hold-off, and refuse to contract ahead except at pre-strike prices, I believe that the sellers will have to fall into line with the producers of solid fuel, who are now quoting pre-strike figures.

F. Livesey.

Gas Company,
Maidstone,
April 4, 1927.

Bognor Gas and Electricity Bill.

Sir,—I notice in your issue of March 30 (p. 820) that, in your report upon this Company's Gas and Electricity Bill, you state that Mr. Rowand Harker said "the authorized capital of the Company was £704,000, of which there remained," &c. I would like to draw your attention to what is obviously a printer's error, as the correct figure is £104,700 authorized.

Seeing that the subsequent particulars, so far as capital is concerned, have a bearing upon this item, I think it as well that your attention should be called to the error.

F. G. Watson, Secretary.

Bognor Gas Light and Coke Company.

Coke Stoves and Coke Condition.

Sir,—We have read with interest the paper in the "Journal" for March 23 by Dr. E. W. Smith on the "Utilization of Gas Coke." It is noticed that Dr. Smith, referring to the foreign-made "E.M.J." stove, states that a special feature of it is the provision of ventilating tubes at the back of the fire; but he seems to have failed to notice that our "Esse" stoves are fitted with our patent automatic valve damper, which also acts as a ventilator to the room.

The greatest trouble we have found with gas coke is the difficulty in getting gas undertakings to supply it graded to the proper size. Most of them appear to prefer to sell it in bulk, and do not cater for ordinary household requirements, or, when they do sell it for household purposes, it is frequently full of dross and very wet.

Smith & Wellstood.

Bonnybridge, Stirlingshire,
April 2, 1927.

Long-Distance Transmission of Gas.

Sir,—As you know, there has recently been much talk in this country about "Ferngas," in connection with the big project of the Westphalian coalowners to lay several high-pressure pipelines from the Ruhr to Hamburg, Lübeck, and other places near the sea, as well as to Berlin, Magdeburg, Leipzig, and other cities in central Germany. Many promoters of this project seem to think, and like to say, that the idea is an entirely new one. Not being disposed to let this misstatement pass uncontradicted, I conceived the plan of ascertaining where, at what time, and by whom the idea was published for the first time. By looking over the pages of all my, and our Company's, books containing historical dates on gas matters, I found in a booklet edited about 60 years ago by Herr Blochmann (of Dresden) a short notice saying that in the year 1828, in London, there was made a proposal to produce in the neighbourhood of the coal pits in Staffordshire the gas needed for the Metropolis, and to convey it to London by a pipeline about 110 miles long. Regrettably, Herr Blochmann did not know—or, at least, did not state—the name of the gentleman who was then responsible for the idea; but in a footnote he mentions as the source of his notice Accum's "Repertory of Patent Inventions," Series 3, viii., 59. This "repertory" not being available here, and finding no mention of the proposal in the "Treatises" of Accum, Clegg, King, and other British authors, I beg to ask you and your readers to help me in the endeavour to rescue from oblivion the name of the originator of the "Ferngas" idea, and to publish it, and any other historical dates connected with the idea, in the columns of your "Journal." I feel sure that the aforesaid proposal was suggested several times for London, Manchester, and other cities in your country.

Owing to the fact that the idea in all probability originated in England, I hope you will be able to answer this request.

Fr. Schafer.

Dessau, am
Krosigkstr. 5,
April 2, 1927.

Fuel Consumption in Continuous Vertical Retorts.

Sir,—In the interesting and lucid paper read by Mr. S. H. Miles before the London and Southern District Junior Gas Association, entitled "Carbonization—Present and Future," reported in your issue for March 30, p. 809 *et seq.*, the following statement appears:

> It has sometimes been claimed that the fuel consumption is lower with verticals than with horizontals. To the writer it seems that experience will not bear this out.

It is suggested that there is plenty of evidence to support the claim that some systems of continuous vertical retorts can show a lower fuel consumption than horizontal retorts. We need look no further than the paper given by Mr. T. Hardie to the Institution of Fuel Technologists in December, 1926, to find figures on this subject presented with the backing and experience of the largest gas undertaking in the world.

In comparing modern types of horizontal and vertical carbonizing plants, Mr. Hardie wrote as follows:

> In the following table is shown approximately the manner in which the heat supplied to the producer per ton of coal carbonized is finally distributed when horizontal and continuous vertical retort settings are used.

—	Horizontal System.	Continuous Vertical System.
	B.Th.U.	B.Th.U.
Supplied to producer	4,200,000	3,668,000
Passing up stack	480,000	450,000
Used and lost in producer, carbonizing plant, &c., and recovered in boilers	3,720,000	3,218,000
Heat value of steam recovered	910,000	1,540,000
Used and lost in carbonizing and producer plant	2,810,000	1,678,000

Difference in favour of vertical retorts, 1,132,000 units.

This difference is mainly accounted for by:

(1) Lower temperature of the coke discharge, 1350° Fahr. lower.

(2) Reduced temperature of the volatile products leaving the retorts, 200° Fahr. lower.

(3) Reduced radiation from the bench in consequence of the smaller surface area for a given throughput capacity of the plant.

But the above saving in favour of vertical retorts may perhaps be more clearly expressed in terms of *net* fuel consumption—*i.e.*, heat supplied to producer, *less* heat value of steam recovered from waste gases.

From Mr. Hardie's figures, it will be seen that the net heat consumption per ton of coal carbonized is 3,290,000 B.Th.U. with horizontal retorts, and 2,128,000 B.Th.U. with vertical retorts.

Assuming that the heat value of coke is 12,500 B.Th.U. per lb., the net heat consumption per 100 lbs. of coal carbonized becomes:

Horizontal retorts . . . . . = 11·75 lbs. coke
Vertical „ . . . . . = 7·6 „ „

Even this figure does not show the full value to the gas engineer in the fuel saving effected by carbonization in continuous vertical retorts. The figure of ultimate importance is the net fuel consumption per therm of gas made. Continuous vertical retorts give a higher thermal yield per ton of coal than horizontal retorts. In Mr. Hardie's paper the figures are respectively 78 and 71·7 therms per ton of coal. The net fuel consumption per therm made (expressed as lbs. of coke used per therm) becomes as follows:

Horizontal retorts . . . . . = 3·67 lbs.
Vertical „ . . . . . = 2·18 „

which amounts to a reduction of 40 p.ct. on the net fuel consumption. With coke at 30s. per ton, this represents a saving of 0·24d. per therm of gas made.

To the list of nine advantages in the use of continuous vertical retorts which Mr. Miles gives in his admirable paper, it is suggested that a tenth should be added—"*lower net fuel consumption.*"

E. W. Smith,
Technical Director.

The Woodall-Duckham Companies,
Allington House,
Victoria Street, S.W. 1,
April 1, 1927.

Suggested Purchase of the Crossgates Gas Company.—The Leeds City Council are to be asked to purchase the undertaking and property (other than the reserve fund) of the Crossgates, Halton, and Seacroft Gas Company, Ltd., for £51,584, with a further sum of £3750 as compensation to the Directors and Manager of the Company, and to take over the stocks in store at a valuation. This proposal is being made as part of the agreement arrived at with respect to the extension of the city.

REGISTER OF PATENTS.

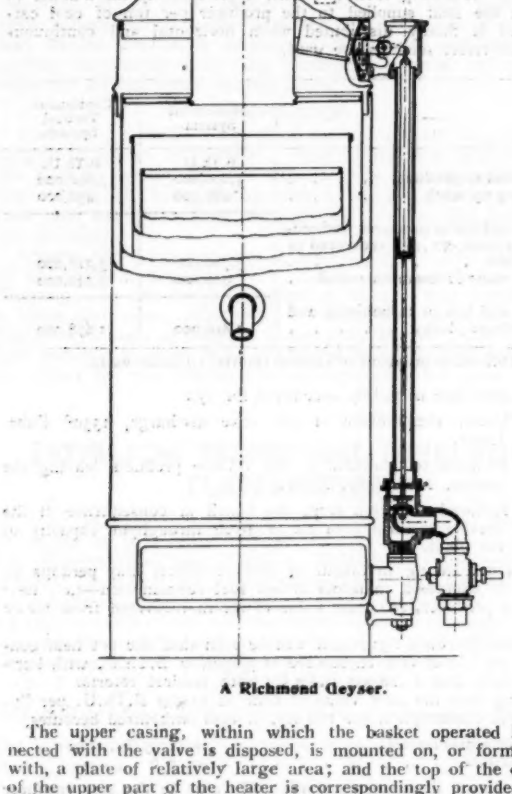
Water Heaters.—No. 266,484.

St. Leger, A. A. H., and The Richmond Gas Stove and Meter Co., Ltd., both of Warrington.

No. 31,037; Dec. 9, 1925. No. 21,619; Sept. 2, 1926.

This invention relates to the type of geyser wherein the gas valve is opened through the medium of the water flowing into a basket; the valve closing again when the basket is emptied.

In the apparatus according to this invention the arm carrying the valve has suspended from it within the gas tube a weight, which acts as a counterweight to the basket; and the valve, weight, and the carrier part are all within an enclosure to which nothing but gas has access. By the gas supply being controlled by the flow of water entering the counter-balance basket, which may be disposed under the lid of the heater, and not by the static pressure or head of the water, the heater and gas supply will work correctly under varying conditions of water supply—that is, independently of the head or pressure of the supply.



A Richmond Geyser.

The upper casing, within which the basket operated lever connected with the valve is disposed, is mounted on, or formed in one with, a plate of relatively large area; and the top of the outer wall of the upper part of the heater is correspondingly provided with an aperture of large area or hand-hole. This plate is fixed over the hand-hole, and the arm of the basket device extends through the plate. All these parts are thus carried by the plate, and so when the gas supply apparatus is to be attached to the body of the heater, they will all be fixed in position together; the hand-hole in the body being large enough to allow the basket to pass through it.

We reproduce a sectional elevation of the geyser, showing one form of the gas supply apparatus.

Water Gas Generator.—No. 255,447.

Misch, O., of Frankfurt.

No. 17,403; July 12, 1926. Convention date, July 16, 1925.

This invention relates to gas producers of the well-known "double" type. Regarding their operation, the patentee says: In order to overcome the difficulty that the sensible heat of the water gas and of the blow gases is not sufficient to maintain the necessary temperature in the retort, various means of applying heat other than the sensible heat of the water gas have been proposed. According to the "Trigas" process, secondary air is introduced between the water gas generator and the distillation retort for burning part of the water gas in order to increase the sensible heat and the temperature of the produced water gas to such an extent that by exhausting the water gas through the retort distillation can take place. By the burning of water gas in the generator, non-combustible gases, especially CO_2, enter the gas, which renders it impossible to increase the calorific value of the gas above a certain degree. On the other hand, the sensible heat of the blast gases resulting from the gasified fuel has been used to heat the distillation retort from outside. It has also been proposed to heat the retort or distillation chamber externally both by the blow gases and by a part of the water gas which is burnt in flues surrounding the retort.

It has further been proposed to heat the retort or distillation chamber by circulating the blow gases from the water gas generator through spiral flues surrounding the retort; water gas being subsequently passed through the retort. But all these ways have not yielded satisfactory distillation, nor can the calorific value of the gas be increased to such a degree as to coincide with the calorific value of the present illuminating gas of 4000 to 4500 calories per cub.m. [450 to 500 B.Th.U. per c.ft.].

According to the present invention, the retort or distillation chamber is adapted to be heated externally by the combustion of part of the water gas, which is introduced into flues surrounding the distillation chamber and passes in a circular way round the retort from the lower to the upper end. By this means a more efficient heat exchange between the heating gases and the fuel is attained.

It is pointed out that the utilization of the waste heat of the water gas process need not be excluded, but that the use of the direct heating of the distillation retort from outside alone renders it possible to attain the necessary quantity of heat and especially the needed distribution of heat in the distillation retort which brings about the most favourable utilization of the latter. The invention is based on the fact that the retort can only be used for increasing the calorific value of the final gas if the temperatures are increased to such an extent that the distillation vapours can be decomposed into permanent gases, which fact can never be attained by the normal way of the "Trigas" process. Also the injection of tar and other oils into the distillation retort for the enrichment of the gas can only be obtained by the additional heating of the distillation retort.

The injection of tar and oil into the retort is claimed, as is the complete plant as described with reference to a drawing.

Purification of Gas.—No. 266,586.

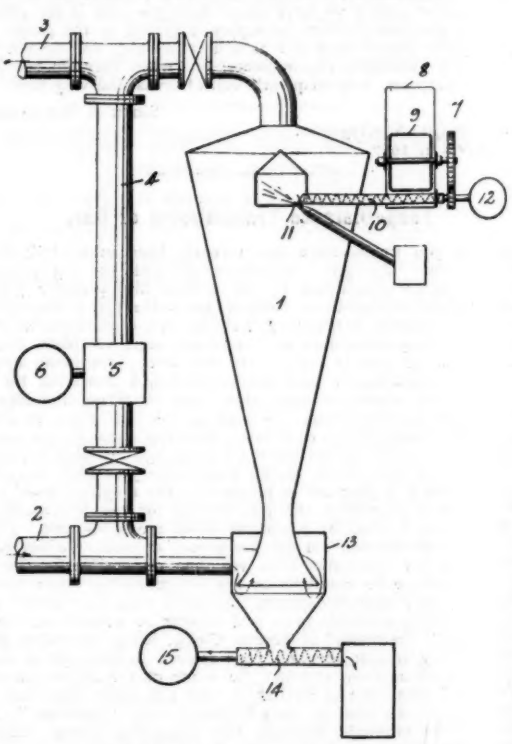
Humphreys & Glasgow, Ltd., of Victoria Street, S.W. 1.

(A communication from E. J. Brady, of Philadelphia.)

No. 15,396; June 18, 1926.

The purification of illuminating and other gas with powdered purifying agent such as hydrated iron oxide involves a chemical reaction effected by contact between the solid particles and the gas; and one object of the present invention is to provide, in a continuous process, for increasing the intimacy and prolonging the time of contact. Another object is to provide simple, reliable, efficient, and comparatively inexpensive apparatus for carrying out the process.

Broadly, the process consists in allowing the solid material in finely divided form to fall freely by gravity through and out at the bottom of a stream of gas ascending with decreasing velocity which checks the fall and retards the descent of the particles of the material at different levels and in a state of diffusion in the stream.



Counterflow Purifier.—Humphreys & Glasgow.

The drawing is a diagrammatic sectional elevation of the proposed apparatus. 1 is a chamber of Venturi shape. 2 is an inlet connection for gas, and, as shown, it communicates with the smaller and lower end of the chamber 1. 3 is an off-take pipe which communicates with the chamber 1 at the upper and larger end thereof;

and the purified gas passes through it. 4 is a by-pass connecting the pipes 2 and 3, and provided with a fan 5 driven by a motor 6. This affords means for keeping the velocity of the gas, flowing to and away from the chamber 1, constant. In the chamber 1, the velocity of the ascending stream of gas decreases progressively at different levels as the vessel flares. 7 is a means for introducing hydrated iron oxide in finely divided form to the stream of gas. It comprises a hopper 8 having a stirrer 9, feed screw 10, and jet 11 which is supplied with purified gas. 12 is a motor for driving the stirrer and the feed screw. 13 is a hood open at the bottom and into which the particles of solid material are discharged by the jet.

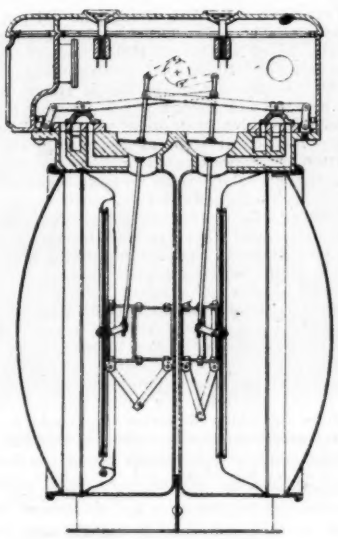
Gas Meters.—Nos. 266,859 & 267,029.

Davis, W. J., of Tottenham, N. 17.

No. 868; Jan. 12, 1926. No. 25,031; Jan. 12, 1926.

In the meter according to this invention, which seeks for space economy and compactness, the operating mechanism at the bellows end is located in the interior of each bellows chamber, and is attached to the inner side of the moving bellows plate facing the division plate. The operating rod is then carried through the floor of the gas inlet chamber through a gas seal which is constructed in association with the gas passage leading from the interior of the bellows to the valve.

The specification describes and illustrates several methods of carrying the above into effect; and we reproduce a vertical section of one design.



Davis's Gas Meter.

In another design, there is applied to the oscillating arm a ball clamped between two parts of a gland, thus forming a ball-and-socket joint.

The above features are covered in the claims, as also is a construction wherein the operating rod, vertically disposed, is slidably mounted to rise and fall, and is connected at its lower end to a toggle which rises and falls according to the dilation of the bellows, and is connected at its upper end to one limb of a bell-crank lever or the equivalent, another limb of which is connected to the valve.

The cognate specification No. 267,029 describes and illustrates the form of toggle mechanism specially applicable to the meter.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 30.]

Nos. 7686—8399.

Barker, G. H.—"Mechanically-operated gas analyzers." No. 8196.
British Furnaces, Ltd.—"Furnaces." Nos. 7940, 7942, 8072, 8073, 8074.
Carpmael, W.—"Process for absorbing ammonia, &c., from gases." No. 7786.
Cunningham, A. B.—See Barker, G. H. No. 8196.
Deutrich, J.—"Gas meters." No. 7908.
Gibb, D. M.—"Gas lighting apparatus." No. 7951.
Helps, A. M.—"Gas cookers." No. 7734.
Humphreys & Glasgow, Ltd.—"Purification of gas." No. 8376.
I. G. Farbenindustrie Akt.-Ges.—See Carpmael, W. No. 7786.
I. G. Farbenindustrie Akt.-Ges.—"Drying agent for gases." No. 8303.
Koppers Company.—"Manufacture of coal products." No. 8268.
Misch, O.—"Process of generating gas." No. 7776.
Parkinson Stove Company, Ltd.—See Gibb, D. M. No. 7951.
Smith, E. W.—See British Furnaces, Ltd. Nos. 7940, 7942, 8072, 8073, 8074.
Surface Combustion Company.—See British Furnaces, Ltd. No. 7940, 7942, 8072, 8073, 8074.
Sutcliffe, E. R.—"Apparatus for distillation of coal, &c." No. 8386.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Bognor Gas and Electricity Bill: Reported from the Select Committee, with amendments.

Commercial Gas Bill: Reported, with amendments.

Farnham Gas and Electricity and Reading Gas Bills: Read a second time, and committed.

HOUSE OF COMMONS.

Progress of Bills.

Matlocks Urban District Council Bill: As amended, considered; to be read the third time.

Leeds Corporation Bill: Reported, with amendments, from the Local Legislation Committee.

Petition Withdrawn.

The petition deposited on behalf of the Wandsworth, Wimbledon, and Epsom District Gas Company against the Southern Railway Bill has been withdrawn.

Gas Regulation Act.

The gas funds accounts for the year ended March 31, 1926, have been presented to both Houses.

Coal Carbonization Tests.

Mr. H. Williams (for Sir Frank Sanderson) asked the President of the Board of Education if he was aware that two experimental plants for the slow carbonization of coal have been, or were shortly to be, erected at the works of the Gas Light and Coke Company—one to the specification of Mr. Hird, of Bradford, and one to the specification of the Fuel Research Board, both of which were to be tested by the Fuel Research Board; and whether he was in a position to give any information as to the probable date of the tests to be made or any other developments in connection therewith.

The Duchess of Atholl, who replied, said the President of the Board of Education understood the Gas Light and Coke Company were considering the erection of a low-temperature carbonizing plant of the type devised by H.M. Fuel Research Station, but at the present stage he would prefer to make no further statement. He had no information as to the other plant to which reference had been made.

LEGAL INTELLIGENCE.

ASSESSMENT APPEAL.

Blyth Gas Company.

In December last the Blyth Gas Company took the advice of an expert on the rating of gas undertakings with reference to the assessment on their concern; and on the advice given, notices of objection were served against the existing assessments. These objections have been before the Tynemouth Union Assessment Committee on four occasions; and on the 30th ult. a final decision was given. The assessment objected to amounted to £2537 10s. net rateable value; and the Committee have reduced it to £1900. In consequence of this reduction in the assessment, the Blyth Gas Company have applied for a refund of rates overpaid to the extent of over £600.

When the case was before the Assessment Committee, it was pointed out that this assessment was made in 1904, and that since that time the conditions of the gas industry had wholly changed. One important factor was the present rates in the pound, which were a very serious matter indeed for any industry in the parish of Blyth. A further point to which particular attention was called was the different nature of the business now carried on. In order successfully to compete with other forms of lighting and heating, the gas industry has to-day to provide all kinds of chattels to induce the sale of gas; and statistics for a quarter of a century past were supplied to the Assessment Committee showing the growth of this auxiliary business, and also the growth of the receipts received from the hire of these various chattels. It was suggested to the Committee that the main source of the Company's profits in this particular instance was not from the manufacture of gas at all, but from the hire of chattels. Another very important matter which was raised was on the question of repairs and maintenance. It was pointed out that, in consequence of the different construction of the roads, leakages were very much more difficult to locate, and the repairs and re-instatement were far more costly at the present time than when this assessment was made. The consequence was that the statutable deductions now allowed on the assessment were wholly inadequate.

The Company's adviser, Mr. E. Howard Collins, of 45, Parliament Street, Westminster, S.W. 1, gave notice that he should advise the Company to accept the reduction granted for the current rate only, and that when the new Assessment Committee, under the 1925 Act, came into being, further notices of objection would be served; for the Company had no desire to embarrass either the present Assessment Committee or the Overseers of the various parishes in closing up their books to the 31st of March, as a continuing appeal would do.

MISCELLANEOUS NEWS.

REDUCTIONS IN THE PRICE OF GAS.

The increase of 3d. per 1000 c.ft. at Bolton, imposed during the coal stoppage, will be taken off from the June quarter readings.

The price at Cardiff has been reduced by 2d. per therm, bringing it to 9d. per therm.

The Directors of the Croydon Gas Company have announced a reduction of 1d. per therm in respect of all gas supplied after the Lady-day quarter. The prices are now 11d. per therm in the Croydon district and 11¼d. per therm in the Caterham district.

The Darlington Gas Committee are recommending that the price be reduced by 8d. per 1000 c.ft.

Notice has been given by the Dawlish Gas and Coke Company, Ltd., that as from April 1 the price is reduced by 5d. per 1000 c.ft.

The Oswaldtwistle Gas Committee have reduced the price of gas ¾d. per therm to power users as from April 1.

At Pickering the price has been reduced by 5d. per 1000 c.ft.

The Stourbridge Town Council have adopted a report of the Gas Committee recommending a reduction in price for ordinary and power supplies by 6d. per 1000 c.ft.

The Thirsk Gas Company have reduced the price from 6s. 8d. per 1000 c.ft. through ordinary meters to 5s. 6d. With regard to pre-payment supplies, the amount of gas per 1d. has been increased from 12 to 14 c.ft. Prior to the coal strike, the price was 5s. 3d. and 14 c.ft. for 1d.

GAS COMPANIES' RESULTS FOR 1926.

Devon.

Presiding at the annual meeting of the Devon Gas Association, Mr. H. J. Kew (Managing Director) said the past year would go down in history as one of the most trying the gas industry had experienced. The Association felt to the full the devastating effect of the coal strike. Stocks of English coal lasted for three months of the strike, but it needed nearly 2000 tons of American and German coal to continue the gas supply, so that it would be no surprise to the shareholders to find that their expenditure on coal for the year was about £2500 above the normal. They were able partially to recover that heavy expenditure by increasing the price of gas and coke, but they were still left with a balance to be provided for out of the coming year's trading. It had to be borne in mind that the distribution of coal to, and the maintenance of a continuous supply of gas at, nine distinct works in such circumstances was no easy matter. The Directors had decided to reduce the price of gas on March 31, and to return to pre-strike prices by June 30, if possible. During the year the undertaking at Lyme Regis and its freehold had been purchased, and the works largely reconditioned. The purchase and development of other works had necessitated raising further capital; and at recent extraordinary meetings it had been decided to issue £12,000 new ordinary shares and debentures, for which a gratifying demand had already been made. The Directors looked forward with every confidence to the future. The nine works were never in better condition, and the benefits to be derived from associated management were likely to be even greater in the future than in the past. Mr. Thornton Willey seconded; and the report was adopted. A 7½ p.ct. dividend was declared.

Exmouth.

In spite of the difficulties created by the coal stoppage and the general strike, the Directors of the Exmouth Gas Company, at the annual meeting, recommended a dividend of 7 p.ct. on the consolidated ordinary stock. The Directors reported that the sales of gas for the year showed an increase of 5·37 p.ct. The new carburetted water gas plant, which was completed in July, proved of great assistance during the period of the coal strike, and was the means of reducing the heavy expenditure for the supplies of foreign coal. The report was adopted, on the motion of Mr. Lewis D. Thomas (Chairman of Directors), who said it was astonishing that the business had stood the strain of the past year so well. The Directors had been able to reduce the price of gas to the pre-strike figure.

Lewes.

The profit for the half-year ended Dec. 31 was £1193, and dividends were declared of 5 p.ct. on the original capital stock and 3½ p.ct. on the additional capital stock. The sales of gas showed an increase of over 11 p.ct. The Directors have accepted a tender for the erection of vertical retorts. It was suggested by Alderman Every, who is connected with the Newhaven Gas Company, that the Lewes Company should give attention to the provision of a showroom.

Extensions at Stourbridge.—At a recent meeting, the Stourbridge Town Council approved of the Gas Committee's recommendation that the vertical retort plant should be extended at a cost not exceeding £15,000.

Boys Killed by Explosion.—Two scholars at the Westminster Technical Institute in Vincent Square, S.W., were severely burned as the result of an explosion in the plumbing and gasfitting shop of the school last week, and died after admission to the Westminster Hospital. Their names are Maynard Stolworth, aged 15, and James Playle, aged 14. After the explosion the two boys rushed into the playground with their clothing on fire, and some of their comrades put the flames out by wrapping coats round them. At the time of the explosion about 20 apprentices were being taught jointing. Boys were using blow lamps, it is stated, and some of the students had been filling them with methylated spirit, which in some way became ignited. A drum burst, and blazing spirit ran over the floor of the workshop.

NEWPORT PAGNELL GAS ORDER.

An inquiry was held by Mr. J. F. RONCA (Director of Gas Administration) at the offices of the Board of Trade, on Friday, March 25, into the provisions of a Special Order promoted by the Newport Pagnell Gas and Coke Company, Ltd., under section 10 of the Gas Regulation Act. The main purposes of the Order are to authorize the raising of further capital, and to extend the area of supply of the Company to include a number of parishes in the rural district of Newport Pagnell. The only opposition was that of the Newport Pagnell Urban District Council, and concerned a clause exempting the property of the Company, other than dwelling houses, from the operation of building bye-laws. The clause in question read as follows:

> Any building of the Company (not being a dwelling house) shall be exempt from the operation of any bye-laws under section 157 (Power to Make Bye-laws respecting New Buildings, &c.) of the Public Health Act, 1875, for the time being in force in the district of any local authority within the limits of supply.

The Company were represented by Mr. H. GIBBON PRITCHARD (Messrs. Sharpe, Pritchard, & Co., Parliamentary Agents), who was accompanied by Mr. P. J. CHANNON (Secretary of the Company). On behalf of the Urban District Council there were present Mr. ARTHUR J. ROBERTS (Clerk to the Council) and Mr. W. J. BUDD (their Surveyor).

Mr. GIBBON PRITCHARD said that, though he did not know of any precedent for the clause in a Gas Order, it had been given in many instances in recent years in Private Bills; and he believed he was right in saying that the Ministry of Health proposed to insert in their bye-laws under section 157 of the Public Health Act in the very near future—if they had not already put it forward for confirmation—a bye-law which did give exemption to the buildings of public utility companies. Public utility companies were given special powers to carry out certain obligations to the public, and ought not to be bound by the restrictions which were properly applicable to domestic buildings or ordinary buildings used as business premises. The Company were simply asking that these bye-laws should not apply to buildings which they might have to erect for the purpose of carrying on the gas undertaking, and did not wish that any buildings they erected as dwelling houses should be exempt.

Mr. ROBERTS agreed that what were known as the full urban series of bye-laws did contain the exemption clause referred to; but the bye-laws in force in the Newport Pagnell urban district—which was mainly rural in character—were known as the intermediate series of bye-laws, which contained no such exemption clause. The Council contended that the exemption asked for by the Company deprived them of the discretion they now enjoyed under the bye-laws, by the exercise of which discretion they could at their pleasure give exemption. No such exemption clause as this had ever been inserted in an Order made under section 10 of the Gas Regulation Act; and there was no precedent for it in a case such as this, in a semi-rural district, where the intermediate series of bye-laws applied.

Mr. PRITCHARD pointed out that if the Council made bye-laws they would have no discretionary power to waive their enforcement.

Mr. ROBERTS said the Council had discretion as to whether or not they should insert an exemption clause in any bye-laws they made.

Mr. RONCA intimated that he would not give a decision at the moment, but would consider the points raised.

The inquiry then closed.

The parishes in which the Order authorizes the Company to supply gas are those of Chicheley, Great Linford, Lathbury, Little Linford, Moulsoe, North Crawley, Sherrington, and Willen. If, after the expiration of five years from the date of the Order, the Company have not laid mains for the supply of gas in any parish or part of a parish within the added limits, the local authority of the district, or any company or person, may apply for an Act or Special Order for the purpose of providing such a supply. A differential price of not more than 2·4d. per therm is authorized in the added limits. Power is given to raise a further £10,000 capital (to include premiums); but the total share capital is not to exceed £18,000. There is power to borrow up to half the total amount of capital raised. The dividend on the additional capital, ordinary or preference, and interest on borrowed money, is limited to 7 p.ct. There is power to offer shares to employees to any amount specified by the trustees of any co-partnership scheme adopted, and also to grant pensions. The maximum charge for the hire of prepayment meter and fittings (including cooking stove) is 2·4d. per therm; for prepayment meter and fittings (without cooking stove), 2d. per therm; and for the meter without fittings, a maximum of 1·2d. per therm or 10 p.ct. on the cost of the meter, whichever should be the higher. There is a clause compelling consumers to repair fittings, appliances, and piping in a dangerous condition, exemption being given, as is now usual, to the property of railway companies (other than dwelling houses). A bulk supply clause is inserted, with the proviso that no such supply shall be given outside the limits of supply if this would interfere with the supply inside the limits.

At the Aberystwyth Police Court on March 30, Enoch Davies, a former member of the Aberystwyth Town Council, was charged with the theft of gas from the Aberystwyth Gas Company. Mr. J. L. Davies, a collector for the Company, said he called at the defendant's house to examine the slot meter. He discovered that the meter had been disconnected, and the inlet and outlet pipes joined up with a piece of rubber tubing. The defendant pleaded not guilty. He said there was a leak through the meter, so he joined the pipes with tubing. The Bench found the defendant guilty, and fined him £1.

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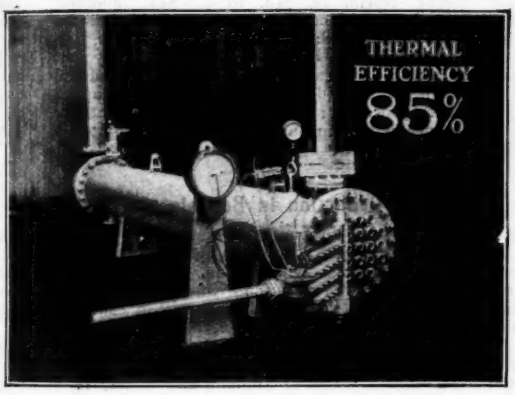

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ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly Meeting of the Company was held in Dublin on March 30—Mr. Joseph X. Murphy (in the unavoidable absence of the Chairman, Mr. F. J. Dickens) presiding.

Chairman's Statement.

Mr. Murphy read the statement which the Chairman had prepared to submit. In this Mr. Dickens expressed his regret and that of the Board at the death of Mr. Augustine Bond, who had been a Director since 1914, and whose services had been of the highest value. They had elected to the Board Mr. J. J. Meagher.

The Coal Stoppage.

At the last half-yearly meeting he explained that, in anticipation of a coal strike occurring, they had taken the precaution of accumulating a substantial stock of coal, sufficient at least for three months. Contracts were entered into in the early summer for supplies of American coal sufficient to carry them through until November. Up to about the middle of October, it was possible to obtain regular and adequate deliveries of very good American coal at a moderate increase in price of something like 30 p.ct. in excess of contract supplies. The situation then developed into a position which caused the gravest possible concern, and prices advanced from a modest 30 p.ct. to practically 200 p.ct. over contract figures. Their Company's record, however, was probably unique, as they had heard of no other case where the price was reduced by 10 p.ct. two months after the strike commenced, and was not subsequently increased. The reduction of the price at the time it was made was undoubtedly a bold course to take, but results had abundantly justified it in largely increased sales, with general satisfaction and benefits to consumers and stockholders alike. Their sales were up by almost 20 p.ct. The quantity of gas represented by this latter percentage was no less than 162 million c.ft. in the half-year alone, or, if the additional sales for the June half-year were added, they got the extraordinary total of 240 millions as the increased output for 1926.

Helping Others.

Soon after the acute shortage occurred in the coal supplies in the city, their stocks warranted rendering some help to others less favourably situated. As soon as they felt there was no immediate risk of jeopardizing the continuity of the gas supply, assistance was rendered to other public utility services, which included the Railway, the Electricity Department, the Tramways, the Port and Docks Board, and numerous provincial gas-works. They also helped the hospitals and other institutions, as well as the poor, by rationing the available supplies of coke.

Last year he drew attention to the remarkable popularity of the prepayment meter, and the striking development in prepayment gas consumption. During 1925 they sold 729¼ million c.ft. by this means, which represented an increase of 78 p.ct. over the corresponding figure for 1914. In 1926 the sales had risen to 898 millions, equivalent to an advance of 119 p.ct. over 1914. The demand for further gas supplies showed no signs of abating; and in the past year they secured 6520 new consumers.

Increased Dividends.

The income for the half-year was larger by £56,618, but expenditure had increased to the extent of £85,045, so that the profit which they were enabled to carry into net revenue was less by £28,427. After meeting interest charges and income-tax, there remained the sum of £22,939, to which must be added the carry-forward from last account, making £34,765, which would be reduced to £3389 after payment of the dividend recommended at the rate of 7 p.ct. per annum.

A NOVEL IDEA.

From Messrs. Clayton, Son, & Co., of Leeds.

One of the teams entered by Messrs. Clayton, Son, & Co., Ltd., of Leeds, won the St. John Ambulance Brigade (Leeds) Trophy on Saturday, March 19 last. Eight teams entered; and the winning team secured 125 marks—the running-up team receiving 117 marks. Another team from the same works obtained the fifth place.

In connection with the Clayton Sports Association, the trophy for the Inter-Departmental Cricket Competition has just been completed. It has been awarded to the firm's punching shop for the season 1926. The trophy is rather an unusual one, and consists of a substantial light oak panel in a frame of darker oak. On the panel is painted suitable lettering and a four-lift spiral gasholder in black and red; and each year the Captain of the successful Department Team puts in, or "erects," a lift consisting of a silver plate, which is fastened over one of the lifts of the painted gasholder on the panel. Great interest was displayed as to which team was to have the honour of putting in the first lift.

Buxton Gas Undertaking.—In his annual budget statement to the Buxton Borough Council, Alderman Buckley (Chairman of the Finance Committee) alluded to the satisfactory position of the various trading concerns of the Corporation, and particularly to the gas undertaking. In connection with the latter, he said that the increased cost of coal due to the coal stoppage was £9671; and this was in part met by the extra amount received for coke and residuals. There was £3775 to be borne by the undertaking, which amount was met by the increased charges. There was now a profit estimated at £2702. Of this sum, £1350 was being taken for the relief of the rates—a result which reflected great credit on the Gas Committee and the Engineer and Manager, Mr. F. G. Shaw.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST

Prospects are no better, and, while a few collieries may be well supplied with trade over the Easter holiday, the general position is weak. The American strike has begun; but opinion here is that it can have no effect on the British market for at least two or three months. There are said to be very large stocks on hand, and less than half the miners of the country are included in the Union. If it proves to be a long affair, it might, later on, create some demand for our coal in the South American market, and lessen American competition in the Mediterranean, which is at present quite a serious factor. The threatened trouble in France appears to have been settled.

Northumberland steams are generally very weak, and the shortage of orders is serious. At the quoted f.o.b. prices of 15s. 3d. for screened and 10s. 6d. for smalls there must be many losing money.

The Durham position is little changed from the previous week. Gas coal is reported in slightly better demand, and producers of better grades are fairly comfortable. Quotations are maintained at 17s. 6d. f.o.b. for Wear Specials, and 17s. to 17s. 6d. for bests, some brands, such as Holmside, being able to get the higher figure. Seconds are a shade firmer at 15s. 3d. to 15s. 9d. f.o.b. Coking is in poor demand at about 15s. 6d. or less, and bunkers are freely offered, down to 15s. for some qualities.

Coke is about steady, gas makes being quoted 23s. f.o.b. for shipment, and foundry about 24s. 6d.

YORKSHIRE AND LANCASHIRE.

Gas coals in Yorkshire and Lancashire are in good demand for forward delivery. The export market is weak.

With the milder weather there is not much change in the position of house coal, which moves slowly at prices which are rather discounted from previous figures.

The industrial situation is likely to improve in the near future. Indications are that coal is now obtainable at a figure that is interesting.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 21s. 3d. to 21s. 6d.; screened gas, 20s. to 21s.; washed trebles, 20s. 6d. to 21s.; washed doubles, 19s. to 19s. 6d.; washed singles, 18s. to 18s. 6d.; washed smalls, 14s. 6d. to 15s. 9d.; unwashed doubles, 17s. 6d.; rough slack, 12s. 9d. to 13s. 3d.; smithy peas, 19s. 6d. to 21s. 6d. per ton. West Yorkshire—Hartleys B (f.o.b. Goole), 18s. 6d. to 20s. 6d.; screened gas, 19s. 6d. to 20s.; washed trebles, 19s. 6d. to 20s.; washed doubles, 19s. to 19s. 6d.; washed singles, 17s. 6d. to 18s.; washed smalls, 15s. to 15s. 6d.; unwashed trebles, 19s. to 19s. 6d.; unwashed doubles, 17s. to 17s. 3d.; rough slack, 13s. to 13s. 6d.; per ton. Derbyshire and Nottinghamshire—Top hards, 22s. 9d. to 23s. 6d.; washed trebles, 20s. 6d. to 21s.; washed doubles, 19s. to 19s. 6d.; washed singles, 18s. 3d. to 18s. 9d.; washed smalls, 14s. 9d. to 15s. 3d.; unwashed doubles, 18s. 6d. to 19s. 6d.; rough slack, 13s. to 14s. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam, 18s. to 20s.; gas coke, 25s. to 30s.; furnace coke, 28s. to 30s. per ton.

MIDLANDS.

The subsidence of pithead prices for household coals continues. Some collieries which had not revised their lists since the beginning of March have made substantial cuts; in other cases the downward movement has been more gradual. Dire foreboding is caused by the very marked shrinkage of demand. Cold winds and rains have helped to relieve the congestion on rail and throughout the distributive channels; but the effect on current output is inappreciable.

The domestic consumer is determined to rub along with the minimum of stocks. There are complaints that the middleman's prices are not following the downward course of pithead quotations, or that they are at any rate lagging far behind. This is the only way, of course, in which the distributor can mitigate the effects of the sudden collapse of the market on purchases beforehand, for there is no encouragement to suppose that a bolder policy would do anything to stimulate buying. Selected household grades can now be had round about 34s. at the pithead, and the lower qualities at proportionately less.

Industrial fuel has developed no new feature. Steams are offered at 18s. upwards, according to source. D.S. nuts can be bought at less than 13s.; but for good grades a shilling or two more is required. Beans fetch 11s. 6d. upwards. Slacks are quite firm owing to smaller production. About 10s., with some play either way, is the prevailing level.

Contracts for blast-furnace coke are being made at 22s. at ovens; but buyers are limiting their commitments as far as they dare. "Other purpose" cokes are somewhat easier. A number of pits are not making more than half time.

CONTRACTS OPEN.

Retort Bench, with Hoppers, Handling Plant, & Charger-Discharger.

Tenders for the above plant are invited by the Gas Committee of the Plymouth Corporation. [See advert. on p. 65.]

Pipes, Valves, Syphons, and Specials.

Tenders are invited by the Gas Committee of Plymouth Corporation for the supply of gas main pipes, &c. [See advert. on p. 65.]

Resetting Retorts.

The Gas Committee of the Lisburn Urban District Council are inviting tenders for resetting a bed of retorts. [See advert. on p. 65.]

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April* 4.

There is rather more inquiry for pitch. Some buyers appear to have certain requirements still to cover for this season, and it is difficult to fix an actual price.

Creosote continues in demand, and is firm at about 8¾d. to 9d. per gallon f.o.b. steamer.

Pure benzole is steady at about 2s. to 2s. 1d. per gallon, and pure toluole about 2s. 3d. to 2s. 4d. per gallon. Solvent naphtha 95/160 is quiet at about 1s. 8d. to 1s. 9d. per gallon.

Phenol continues in demand, and supplies are scarce for early delivery. The current value is about 7½d. per lb. f.o.b.

Tar Products in the Provinces.

April 4.

Business is still very quiet, with the exception of South Wales patent fuel makers, who appear to be amply supplied. There are very few orders in the market.

Creosote is steady. Water-white products are affected further by the fall in the price of petrol.

The average values for gas-works products during the week were: Gas-works tar, 59s. 6d. to 64s. 6d. Pitch, East Coast, 77s. 6d. to 82s. 6d. f.o.b. West Coast—Manchester, 75s. to 82s.; Liverpool, 77s. 6d. to 82s. 6d.; Clyde, 80s. to 82s. 6d. Benzole, 90 p.c.t., North, 1s. 6d. to 1s. 7d.; crude, 65 p.c. at 120° C., 1s. 0¼d. to 1s. 0¾d., naked at makers' works; 50-90 p.c.t. naked, North, 1s. 7d. to 1s. 8d. Toluole, naked, North, 1s. 7½d. to 1s. 8½d., nominal. Coal-tar crude naphtha, in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 3½d. to 1s. 4½d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, in bulk, North, liquid, 7½d. to 7⅝d.; salty, 7¼d. to 7½d.; Scotland, 7⅝d. to 7¾d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.c.t., 1s. 8½d. to 1s. 9½d. prompt. Naphthalene, £11 to £14; salts, 100s. to 110s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.c.t., purely nominal; "B" quality, unsaleable.

Further Reduction in Benzole and Petrol.

Last Monday a reduction was made of 1d. per gallon in the wholesale and retail prices of both benzole and petrol. "National" benzole mixture, it was announced, would be 1s. 3½d. per gallon in London, and corresponding changes were made in the price for the provinces, Scotland, and Ireland. "National" benzole in cans has also been reduced; the new price being 2s. 1½d. in England and Wales, and 1d. above for Scotland. The reduction of 1d. in the price of petrol brings the figure in the Metropolitan Police Area to 1s. 2½d.; outer London zone, 1s. 2½d.; rest of England and Wales, 1s. 3½d.; Scotland, 1s. 4½d.; and Northern Ireland, 1s. 5½d. This is the second reduction in a little more than a fortnight; the last one being on March 16, when the price dropped 2d. per gallon.

The Manchester and Sheffield Tar-Works Company, Ltd., announce that, as from April 1, their interests as tar distillers in Yorkshire will be transferred to the Yorkshire Tar Distillers, Ltd. The business will be carried on under the same management as hitherto.

TRADE NOTES.

Condensing Plant for Aberdeen.

The Aberdeen Gas Committee have placed a contract for new condensing plant with Messrs. W. C. Holmes & Co., Ltd., of Huddersfield.

"Simplex" Gas Plant for Bridge-of-Allan.

The Vertical Gas Retort Syndicate, Ltd., of 17, Victoria Street, Westminster, have received an order from the Bridge-of-Allan Gas Department for an improved "Simplex" gas plant.

"Red Knight" Gas Fires.

This is the name Messrs. Wm. Sugg & Co., Ltd., of Westminster, have given to their new concave gas fire. They have published an illustrated booklet, written in popular style, explaining the advantages which accrue to householders who instal "Red Knights."

All about Firebricks.

An illustrated booklet has been published by Messrs. E. J. & J. Pearson, Ltd., of Stourbridge—which firm was established in 1860—describing their many varieties of refractories. One of the illustrations is of a bed of retorts at the Brierley Hill Gas-Works, Staffordshire, after over six years' continuous working. The total amount of coal carbonized in this bed before it was let down was 36,800 tons

Gas Profits at Dewsbury.—The Dewsbury gas undertaking made a profit of over £12,000 in the past financial year. The result is the more noteworthy because of the difficulties encountered during the miners' stoppage and the fact that the price of gas in the town was not increased.

Colonial Gas Association, Ltd.—The recent issue of £125,000 of 6½ debentures was, we learn, more than three times oversubscribed. Letters of allotment were posted on the 4th inst. The Association have recently acquired four additional gas undertakings—viz., Hay, Wollongong, Tamworth, and Singleton. The gas undertakings now owned by the Association total 23.

STOCK MARKET REPORT.

THE enormous deficit disclosed by the revenue statement naturally accentuated the depression which, in consequence of the Chinese situation, has prevailed on the Stock Exchange during the past few weeks.

The gilt-edged stocks remain singularly firm under the lead of War Loan, which advanced to nearly 102, but business was somewhat restricted by the plethora of new issues. Dealings commenced in the new London County Council 4½ p.ct. Loan, and the price at one time fell to about ¼ discount.

In the Foreign Market, French Rentes were decidedly firm, and the Fives advanced to nearly 16. There was little doing in the Home Rail Market, with the exception of some speculations in Undergrounds.

The Gas Market was satisfactory from the point of view of the existing holders of stock, inasmuch as prices were maintained, with a few individual improvements. With regard to new investors it is understood that many brokers have standing orders, but stock, especially in the smaller companies, is difficult to obtain. Quite a number of transactions were recorded at prices above the maximum quotations; and it is surprising that the latter were not increased. Of the Home Companies, only the Liverpool 5 p.ct. ordinary and the South Metropolitan ordinary were marked up, the former by ½ point at the local exchange, and the latter by 1 point. During the week attention has been drawn to the Imperial Continental Gas stock, which was also marked up by 2 points to 136-139. With the dividend for the year maintained at 10 p.ct., the stock is very attractive, especially having regard to the known reserves.

The following transactions were recorded during the week:

On Monday, Bournemouth 7 p.ct. maximum 12½, 6 p.ct. preference 11⅜, 11¼, Brighton and Hove 6 p.ct. 102, European 6½, Gas Light and Coke, 87⅛, 87¼, 87⅜, 87⅞, 4 p.ct. preference 77, 5 p.ct. debenture 100, Imperial Continental 138, Montevideo 82, Primitiva 14s. 4¼d., 14s. 6d., 14s. 7¼d., 14s. 9¾d., 14s. 10¼d., 4 p.ct. 1st debentures 85¼, 87, 4 p.ct. debenture (1911) 71¼, South Metropolitan 97, 98, 98½, 99, 6½ p.ct. debenture 100⅛. Supplementary prices, British (Norwich) 5 p.ct. debenture 96¾, Hornsey 5 p.ct. preference 84, 85, South Suburban 7 p.ct. debenture 100.

On Tuesday, Bombay 21s., 21s. 6d., Brighton and Hove 6 p.ct. 103½, 104, Commercial 4 p.ct. 84½, 85⅝, 85⅞, European 6 3/16, Gas Light and Coke 87¼, 87⅜, 87½, 3½ p.ct. maximum 60¼, 60⅜, Imperial Continental 138, Montevideo 83, Primitiva 14s. 3d., 14s. 6d., 14s. 6¾d., 14s. 9d., South Metropolitan 98¼, 98½, 3 p.ct. debenture 50½, South Suburban 5 p.ct. 102, Supplementary prices, Oxford 5 p.ct. 128½, 129, 5 p.ct. preference 89, 89½, Weston-super-Mare 6½ p.ct. preference 99.

On Wednesday, Bombay 21s. 6d., Bournemouth 7 p.ct. 12 5/16, Croydon maximum dividend 79⅜, Gas Light and Coke 87, 87½, 87⅜, 87⅞, 3½ p.ct. maximum 60, 60¼, 4 p.ct. preference 76, 77, 3 p.ct. debenture 59½, 5 p.ct. debenture 99⅜, Imperial Continental 138, 138½, Primitiva 14s. 4¼d., 14s. 6d., 14s. 7½d., South Metropolitan 98¼, 6½ p.ct. debenture 100¾, Wandsworth, Wimbledon 5 p.ct. 96. Supplementary prices, Bedford 6 p.ct. preference 100; 100½, Brighton and Hove 7 p.ct. debenture 101¼, Felixstowe 7 p.ct. pref. 99, 100.

On Thursday, Brighton and Hove 6 p.ct. 105, British 106⅜, Gas Light and Coke 87, 87¼, 87⅜, 3½ p.ct. maximum 60¼, 60½, 4 p.ct. preference 76⅜, 3 p.ct. debenture 60, Lea Bridge 5 p.ct. 94½, Newcastle 3½ p.ct. 74⅞, Primitiva 14s. 4¼d., 14s. 5¼d., 14s. 7½d., South Metropolitan 98¼, 98⅜, 99, 99½, South Suburban 5 p.ct. 102½, Wandsworth, Wimbledon 5 p.ct. 97. Supplementary prices, Dorking "D" 20⅜, 20⅞, Tottenham 5 p.ct. preference 86.

On Friday, Bournemouth 4 p.ct. debenture 75, Cape Town 7¾, 4½ p.ct. preference 6, 4½ p.ct. debenture 70, Commercial 3 p.ct. debenture 55½, European £6 4s. 6d., Gas Light and Coke 87½, 87⅜, 87⅝, Imperial Continental 138, 3½ p.ct. debenture 68½, Primitiva 14s. 3d., 14s. 7½d., South Metropolitan 98½, 99½, South Suburban 5 p.ct. 101⅞. Supplementary prices, Romford 5½ p.ct. preference 96s. 3d.

In Lombard Street, with the passing of the demands at the end of the quarter and the distribution of the interest on the 3½ p.ct. Conversion Loan and War Bonds, credits were abundant. Fresh money was available at 3½ p.ct., and towards the close the rate fell to 3 p.ct. It is not expected, however, that these low rates will continue. Discount quotations hardened on the result becoming known of the Treasury Bill allotment. Of these £38,000,000 were allotted, and the average rate—£4 7s. 4·32d. p.ct.—was 7·42d. p.ct. above the previous week's rate.

Most of the movements in the Foreign Exchange Market were small; but there was a sharp rise in Italian lire, the rate declining to 102⅜, closing at 102.90. The improvement is attributed to the City of Rome issue in New York. The dollar-sterling closed at 4.85 3/32. Belgas were slightly dearer at 34.93¾, and pesetas were quoted at 27.07. French francs remained unaltered at 124.

Silver was firm, both India and China being purchasers, and the price rose 5/16d. to 26 5/16d. per oz. for cash.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3, 1925. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 1.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 10	5	5	Aldershot 5 p.c. max. C	70—73	..	..
322,992	,,	,,	4	4	Do. 4 p.c. Pref.	63—71	..	..
1,661,868	,,	Sept. 30	6½	6½	Alliance & Dublin Ord.	88—88	..	..
374,000	,,	Jan. 13	4	4	Do. 4 p.c. Deb.	65—68	..	..
300,000	1	Oct. 14	1/7½	1/7½	Bombay, Ltd.	1—1½	..	21/—21/6
170,000	10	Mar. 10	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
600,050	10	,,	7	7	Do. B 7 p.c.	11½—12½	..	12 5/16—12½
975,000	10	,,	6	6	Do. Pref. 6 p.c.	10½—11½	..	11⅜—11½
60,000	Stk.	Jan. 13	3	3	Do. 3 p.c. Deb.	53—56	..	..
163,025	,,	,,	4	4	Do. 4 p.c. Deb.	73—76	..	75
357,900	,,	—	—	—	Brighton & Hove 6 p.c. Con.	100—105	..	102—105
341,800	,,	—	—	—	Do. 5 p.c. Con.	90—95	..	..
1,327,500	,,	Feb. 24	5	5	Bristol 5 p.c. max.	88—89a	..	..
885,000	,,	Mar. 24	8	7	British Ord.	105—108*	..	106⅝
100,000	,,	Dec. 30	7	7	Do. 7 p.c. Pref.	112—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	75—80	..	..
100,000	10	Dec. 9	8	6	Cape Town, Ltd.	7—8	..	7⅞
100,000	10	Oct. 28	4½	4½	Do. 4½ p.c. Pref.	6—7	..	6
150,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb.	68—73	..	70
626,860	,,	Feb. 24	6	6	Cardiff Con. Ord.	99—102	..	..
327,880	,,	Dec. 30	7½	7½	Do. 7½ p.c. Red. Deb.	100—103	..	..
197,150	,,	Feb. 24	5	5½	Chester 5 p.c. Ord.	86½—91½b	..	..
79,185	1	Sept. 30	†2/-	†2/-	Colombo Ltd. Ord.	27/—29/-	..	..
24,495	1	,,	1/4‡	1/4‡	Do. 7 p.c. Pref.	20/—22/-	..	..
321,490	1	Oct. 14	1/9‡	1/7½	Colonial Gas Assn. Ld. Ord.	25/6—27/6	..	..
178,900	1	,,	1/9‡	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	..
1,513,280	Stk.	Feb. 24	5½	5½	Commercial 4 p.c. Cap.	83—86	..	84½—85⅞
560,000	,,	,,	5/8/4	5/8/4	Do. 8½ p.c. Cap.	81—84	..	..
475,000	,,	Dec. 30	8	8	Do 3 p.c. Deb.	54—57	..	55½
839,000	,,	Sept. 30	‡2	‡1	Continental Union, Ltd.	28—33	..	..
200,000	,,	Mar. 10	7	7	Do. 7 p.c. Pref.	79—82	..	..
727,560	,,	Mar. 10	6½	6½	Croydon sliding scale	96—99	..	..
408,100	,,	,,	5	5	Do. max. div.	77—80	..	79⅜
493,270	,,	Feb. 24	6	9	Derby Con.	104—106c	..	..
55,000	,,	Dec. 30	4	4	Do. Deb.	78—75c	..	..
209,000	,,	Mar. 10	5	5	East Hull Ord. 5 p.c.	76—80	..	..
50,000	,,	Dec. 30	5	5	Eastbourne 5 p.c. Deb.	92—97	+2	..
1,002,180	10	Mar. 24	‡3	‡3	European, Ltd.	5½—6⅜*	..	6¼—£6/4/6
13,747,460	Stk.	Feb. 10	5/1/4	5	Gas Light & Coke 4 p.c. Ord.	86½—88½	..	87—87⅝
2,800,000	,,	,,	3½	3½	Do. 3½ p.c. max.	56—61	..	60—60⅜
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	75—78	..	76—77
5,602,620	,,	Dec. 30	3	3	Do. 3 p.c. Con. Deb.	58—61	..	59½—60
181,315	,,	,,	—	6	Do. 6 p.c. Br'ton'd Red. Db.	100—105	..	..
1,649,770	,,	,,	—	5	Do. 5 p.c. Red. Deb.	99—100	..	99½—100
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
93,500	,,	Mar. 10	6½	6½	Hastings & St L. 5 p.c. Conv	88—90	..	..
268,740	,,	,,	5½	5½	Do. 8½ p.c. Conv.	65—70	..	..
70,000	10	Oct. 14	†10	†10	Hongkong & China, Ltd.	12—18	..	..
178,200	Stk.	Mar. 10	5	5	Hornsey Con. 3½ p.c.	67—69	..	..
1,976,000	,,	Nov. 11	‡10	10	Imperial Continental Cap.	136—139	+2	138—138½
236,170	,,	Feb. 10	3½	3½	Do. 3½ p.c. Red. Deb.	67—69	..	68⅜
235,242	,,	Mar. 10	6½	6½	Lea Bridge 5 p.c. Ord.	92—97	..	94½
9,145,907	,,	Feb. 24	5½	5½	Liverpool 5 p.c. Ord.	80—81b	+½	..
800,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	104—106b	..	..
165,736	,,	Feb. 24	9	8	Maidstone 5 p.c. Cap.	110—115	..	..
63,480	,,	Dec. 30	3	3	Do. 3 p.c. Deb.	52—57	..	..
75,000	5	Dec. 9	†7	†7	Malta & Mediterranean	5½—5⅝	..	..
541,920	Stk.	Nov. 25	†6	†5	Montevideo, Ltd.	80—83	..	82—83
9,081,815	,,	Feb. 24	5	5	Newcastle & Gateshead Con.	73½—74½d	..	..
360,939	,,	,,	4	4	Do. 4 p.c. Pref.	68½—69½d	..	..
691,705	,,	Dec. 30	8½	8½	Do. 3½ p.c. Deb.	63—69d	..	..
131,785	,,	—	—	—	North Middlesex 6 p.c. Con.	93—95	..	..
800,000	,,	Nov. 25	7	9	Oriental, Ltd.	97—102	..	..
188,190	,,	Dec. 30	7½	7½	Plym'th & Ston'house 5 p.c.	105—110	..	..
414,500	,,	Feb. 24	7½	7½	Portsm'th Con. Stk. 4 p.c. Std.	100—105	..	..
236,782	,,	,,	5	5	Do. 5 p.c. max.	76—79	..	..
2,289,909	1	—	—	—	Primitiva Ord.	14/3—15/3	..	14/3—14/10½
282,200	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	85—87	..	85½—87
600,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	70—72	..	71½
434,963	,,	Dec. 30	—	4	Do. 4 p.c. Cons. Deb.	70—72	..	..
150,000	10	Mar. 24	6	6	San Paulo 6 p.c. Pref.	7½—7¾*	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	47—50	..	..
270,000	Stk.	Sept. 16	6	5½	Sheffield A	96—98e	..	..
419,968	,,	,,	6	5½	Do. B	96—98e	..	..
1,047,000	,,	,,	6	5½	Do. C	96—98e	..	..
90,000	10	June 11	4	—	South African	4—6	..	..
4,609,895	Stk.	Feb. 24	5	7	South Met. Ord.	98—100	+1	97—99½
1,895,445	,,	Jan. 13	3	3	Do. 3 p.c. Deb.	57—60	..	59½
734,000	,,	Mar. 10	6½	6½	Do. 6½ p.c. Red. Db.	99—101	..	100½—100⅝
91,500	,,	Feb. 24	8½	8½	South Shields Con.	108—110d	..	..
1,948,795	,,	Mar. 10	6½	6½	South Suburban Ord. 5 p.c.	101—104	..	101⅞—102½
368,837	,,	Dec. 30	5	5	Do. 5 p.c. Deb.	93—96	..	..
647,740	,,	Mar. 24	5	5	South'mpton Ord. 5 p.c. max.	74—77*	..	..
121,275	,,	Dec. 30	4	4	Do. 4 p.c. Deb.	68—78	..	..
250,000	,,	Feb. 24	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	Dec. 30	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
120,060	,,	Feb. 24	7½	7½	Tottenham District A 5 p.c.	105—110	..	..
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	89—92	..	..
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,255	,,	Dec. 9	4	4	Do. 4 p.c. Deb.	72—75	..	..
358,251	,,	Mar. 10	5	5	Tynemouth Con. and New	68½—69½d	..	..
197,594	,,	Mar. 10	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c.	85—90	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	83—88	..	..
91,800	,,	,,	6½	6½	Do. 5 p.c. Maidenh'd	83—88	..	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mar. 10	8½	8½	Wandsworth A 5 p.c.	119—124	..	..
256,686	,,	,,	7	7	Do. B 3½ p.c.	99—104	..	..
432,535	,,	,,	5/19/0	5/19/0	Do. C and New	87—92	..	..
852,000	,,	,,	6½	6½	Wimbledon 5 p.c.	95—100	..	96—97
96,000	,,	,,	7½	7½	Epsom 5 p.c.	101—106	..	..
88,416	,,	Dec. 30	3	3	3 p.c. Deb.	54—57	..	..

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